STX Signal Transmitter
Installation and Operation Manual

CAUTION

It is essential that all instructions in this manual be followed precisely to ensure proper operation of the equipment.

97-1092-01
Rev. E
May 2000

NOTICE

CAUTION

Follow these rules if welding is done on the vessel after installation of Kistler-Morse sensors/ transducers. The electrical current of the welder may pass through the sensor/transducer, causing damage to it and possibly to the signal processor. To avoid damage, follow these precautions:

1. Disconnect the sensor/transducer cables from the signal processor.
2. Ground the welder as close to the welding joint as possible. The welding ground must be between the sensor/transducer and the weld joint to prevent the welding current from going through the sensor/transducer to earth ground.

Note

High temperatures can damage sensors/transducers. If you are welding in the vicinity of a sensor/transducer, monitor the temperature of the metal adjacent to the sensor/transducer. If it becomes too hot to touch, stop welding immediately and remove the sensor/transducer before continuing. Prior to reinstalling the sensor/transducer, verify that no damage has occurred.

This manual reflects STX software revision D and
MVS software revision L (applicable only for an STX
installed in or serially communicating with an MVS).
If you have a previous revision(s), contact Kistler-Morse.

Table of Contents

Chapter 1. Introduction

Stand-Alone STX in NEMA-Rated Enclosure
(can be serially connected to an MVS, PC, etc.)

MVS-STX
STX PCB in a Half-Rack MVS (MVS-4D) or serially connected to a Half-Rack MVS (MVS-4D)

MVS-STX
STX PCB in a 19" Rack MVS (MVS-8D) or serially connected to a 19" Rack MVS (MVS-8D)

Figure 1-1. STX Configurations

Introduction

The STX Signal Transmitter (STX), shown in Figure 1-1, is a single channel signal processor that receives analog input from a strain gage sensor/transducer and provides 0-20 or 4-20 mA output (optional) and digital serial output. The STX's 21 bit analog-to-digital (A/D) converter provides a high resolution, stable conversion. The RS-422/485 serial communication allows a multi-drop network configuration that simplifies field wiring.

Physical Description

The STX provides 0-20 or 4-20 mA current output if purchased with the optional Current Output Printed Circuit Board (PCB) soldered to it.

The STX PCB can be configured in several ways:

- **Stand-alone STX in K-M Supplied Enclosure** — The STX PCB is housed in a NEMA-rated enclosure and wall-mounted near the vessel. The STX PCB is wired from the front. An optional AC line power supply can be purchased from K-M, or the customer can supply their own.
- **Stand-alone STX in Customer-Supplied Panel/Enclosure** — The STX PCB is wired from the front. An optional AC line power supply can be purchased from K-M, or the customer can supply their own.
- **STX PCB in Standard 19" Rack** — The STX PCB is factory-equipped with a connector that plugs into the standard rack. A termination PCB fits onto the STX PCB, and the sensor/transducer is wired from the back to the termination PCB. An optional AC line power supply can be purchased from K-M, or the customer can supply their own.
- **Stand-alone STX serially connected to MVS (MVS-STX)** — The STX PCB is housed in a NEMA-rated enclosure and wall-mounted near the vessel. The STX is wired from the front. The STX is serially connected to a K-M Multi-Vessel System (MVS) signal processor, which can display data for up to 120 channels. An optional AC line power supply can be purchased from K-M, or the customer can supply their own.
- **STX PCB in MVS (MVS-STX)** — The STX PCB is installed in an MVS signal processor, which can display data for up to 120 channels. In this configuration, the STX PCB is factory-equipped with a connector that plugs into the MVS backplane. A termination PCB fits onto the backplane, and the sensor/transducer is wired to the termination PCB. The MVS is available in two models:
  - — MVS-4D (half-rack). The termination PCB is wired from the front.
  - — MVS-8D (19" rack). The termination PCB is wired from the back.

  Power to the STX is supplied by the MVS power supply.

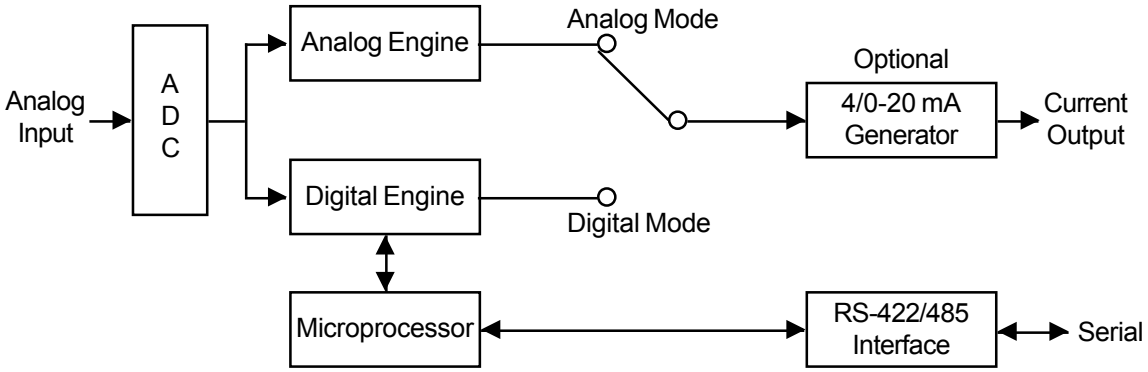


Figure 1-2. Block Diagram of STX Operation

When the STX is installed in or serially communicating with an MVS, the MVS display shows monitoring information from the STX. In these configurations, the system is referred to as the MVS-STX. The MVS keyboard is used to access functions during operation and to input parameters during setup and calibration. The MVS's optional PCBs — Current Output, Relay Output, MVS-RIO, etc. — can be used to further process the STX's digital output.

Functional Description

Analog vs. Digital Mode

Figure 1-2 illustrates STX operation. The STX can receive an analog signal from K-M half bridge sensors/transducers (L-Cell, Microcell, Load Stand II, Load Disc II, or Load Link I/II) or from full bridge sensors/transducers. The STX has two modes of operation:

- **Analog Mode** — The analog engine is calibrated using SW1 (Up Key), SW2 (Down Key), and SW3 (Span/Zero slide switch). When in Analog Mode, current output (0-20 or 4-20 mA) from the STX PCB is controlled by the analog engine.
- **Digital Mode** — The digital engine is calibrated with commands through the RS-422/485 serial port or through the MVS, as applicable. When in Digital Mode, current output (0-20 or 4-20 mA) from the STX PCB is controlled by the digital engine.

It is possible to have two calibrations operating simultaneously. For example, the STX can be in Analog Mode (with current output from the STX PCB controlled by the analog engine). But, at the same time, the STX can be calibrated digitally through the serial port, with displayed engineering units and setpoints, additional current outputs, etc. controlled by the digital calibration.

Note

You must calibrate the STX digitally if the STX is serially connected to another device, even if you have already done an analog calibration.

Filters and Tracking

The STX has several features which help provide stable output:

- The **Sentry™** DSP Filter reduces output changes that can result from vibration.
- Material and zero tracking functions reject sensor drift and other related long-term errors while preserving the output's stability and accuracy.

LEDs

The STX PCB has three LEDs: Status, Transmit (TX), and Receive (RX).

Status LED

The Status LED functions as follows:

- Material/zero tracking disabled — The LED toggles at every A/D conversion, serial communication, or communication with the MVS microprocessor, as applicable.
- Material/zero tracking enabled — If material in the vessel is in motion (rate of change is greater than threshold rate), the LED toggles at every A/D conversion, serial communication, or communication with the MVS microprocessor, as applicable. If material in the vessel is stable (rate of change is less than threshold rate), the LED remains on and does not toggle.

Note

See Chapter 3, Stand-Alone STX Analog Calibration and Setup, or Chapter 8, MVS-STX Service Menu, for details on material/zero tracking.

Transmit (TX) LED and Receive (RX) LED

The Transmit and Receive LEDs toggle when communicating with a serial device to reflect an incoming request (RX) from a host and the response (TX) from the slave.

Manual Contents

A brief description of the key sections of the manual follows:

- Chapter 2 — Hardware Installation
- Chapter 3 — Analog Calibration and Setup of the Stand-Alone STX
- Chapters 4 through 9 — Digital Calibration and Setup of the MVS-STX (STX serially connected to an MVS or installed in the MVS)
- Appendix B — Digital Calibration of the STX serially connected to a PLC or K-M ROPE System

Note

If calibrating or setting up the STX through an Allen-Bradley PLC or Modbus PLC, also refer to the applicable PLC manual — *KM-RIO Installation and Operation Manual*, *MVS-RIO Installation and Operation Manual*, or *MVS-Modbus Installation and Operation Manual*.

Manual Conventions

Three kinds of special explanations appear throughout the manual — **WARNING**, CAUTION, and *Note*. The format and significance of each is defined below:

WARNING

Possible danger to people. Injury may result if this information is ignored.

CAUTION

Possible risk to the product. The signal processor or other equipment may be damaged if this information is ignored.

Note

Contains additional information about a step or feature critical to the installation or operation of the signal processor.

Chapter 2. Hardware Installation

General Information

This chapter provides instructions on how to install and wire the STX. The STX can be installed several ways:

- As a stand-alone unit, housed in K-M's NEMA-rated enclosure or in an enclosure supplied by the customer
- In a standard 19" rack
- In a K-M MVS (MVS-STX)

Refer to the drawings in Appendix H for wiring and installation details.

WARNING

To prevent equipment damage or personal injury once the STX has been connected to power:

- **Disconnect power before wiring anything to the STX, adding or removing PCBs, or mounting the stand-alone STX.**
- **Deactivate power to the controlled devices.**

Review all instructions before beginning installation. Follow all instructions carefully to ensure the equipment is properly mounted and wired.

Unpacking and Inspection

Carefully remove the STX from the shipping container and place it on a flat surface. Visually inspect for damage that may have occurred during shipment. If any damage is evident, note it on the shipping receipt. Report the damage to the carrier and to K-M immediately. Store the shipping container and packing material for later use in the event the equipment must be returned to the factory.

Mounting STX

Do not mount the STX near high power equipment, contactors, SCR drives, 440 V lines, etc. Refer to Appendix A for environmental specifications before mounting.

Stand-Alone STX with Customer-Supplied Panel/Enclosure

Mount the STX in an enclosure and area suitable for the device. The STX dimensions are shown on TI-SP.STX-01 in Appendix H.

Stand-Alone STX with K-M Supplied Enclosure

When mounting the STX, be sure there is enough clearance to open the front door completely. Removal, insertion, and wiring of the modular PCB is done through the front of the unit. The enclosure dimensions are shown on TI-SP.STX-01 in Appendix H.

Note

Mounting hardware is not supplied by K-M.

Follow this procedure to mount the STX:

1. Hold the enclosure against the wall in the desired location and mark the positions of the mounting holes. Place the enclosure in a safe place.
2. Drill the mounting holes in the wall.
3. Attach the enclosure to the wall using hardware that will secure it firmly in place.

Drilling Holes in Enclosure

CAUTION

Remove the electronics before drilling enclosure holes. Drill holes through the bottom or side of the enclosure. **Do not** drill holes through the top as this may allow moisture seepage, which can damage the electronics and void the warranty.

The STX NEMA-rated enclosure has no openings through which to route cables or install conduit. Before you begin wiring, drill entry holes through the enclosure where it is most convenient to route the conduit or cables. Hole location is critical for proper PCB installation. Check clearances to ensure fittings and wire routing will not interfere with the PCB or enclosure door. Refer to TI-SP.STX-01 in Appendix H.

Wiring System

This section describes how to wire the junction box, power, and auxiliary equipment to the STX. Refer to the specifications in Appendix A and the drawings in Appendix H:

- Stand-Alone STX — TI-SP.STX-02
- STX in Standard 19" Rack — TI-SP.STX-03
- STX in MVS — TI-MVS.STX-01

WARNING

All wiring must comply with government or local codes.

Wiring Junction Box to STX

CAUTION

Do not route junction box cables in the same conduit with AC power cables.

Notes

1. Seal all conduit fittings against water entry. Install conduit drains at conduit's lowest elevation(s) to allow condensation to drain.
2. All wiring routed between junction boxes and STX must be continuous (no splices).

Refer to Appendix H. Instructions are provided for half-bridge and full-bridge sensors. Refer to the sensor manufacturer's manual for wire/cable specifications.

Note

Full-bridge sensors — If voltage decreases as weight is added, switch the +In1 and -In1 wires.

Wiring Power

WARNING

When connecting power to this unit:

- **Power wiring must comply with the national wiring requirements for the country in which the equipment is installed.**
- **The ground conductor must be connected to the Protective Earth (PE) terminal.**

Refer to the instructions below and Appendix H:

- DC (standard) — STX operates on nominal 15 to 24 Vdc (actual 14.4 to 30 Vdc) power.
- AC (option) — STX operates on 100, 120, or 230 Vac factory-set power.

Note

The standard lead colors for AC power in North America are:

- Ground = Green
- Hot = Black
- Neutral = White

Wiring Current Output

The fully isolated 0-20/4-20 Current Transmitter is an optional PCB that is factory-soldered to the STX PCB. Refer to Appendix H.

External Current Loop Power Supply

The STX's Current Transmitter Loop is powered by the STX power supply. However, an external power supply may be desired for some applications. The maximum allowable voltage from the external power supply is 50 Vdc. The minimum allowable voltage is based on the loop resistance, allowing a 2 Volt overhead for the output's current sensing. For example:

1000 ohms x 0.020 amps = 20 Volts
Minimum voltage =
20 Volts + 2 Volts (overhead) = 22 Volts

Wire the current transmitter external power supply as shown in Appendix H. Move the JP11 jumper on the STX PCB to the Ext pins.

Wiring Serial Communications

Refer to Appendix H.

Sealing Openings in Stand-Alone STX Enclosure

After conduit and cable installation is complete, seal around the openings in the STX enclosure to prevent moisture seepage.

CAUTION

Only use Sikaflex 1A polyurethane sealant or Dow Corning RTV 739 or RTV 738. Other sealants may contain acetic acid, which is harmful to electronics.

Setting Serial Address

Note

Setting the addressing rocker-arm switch is not required unless you are using the serial port on the STX PCB.

The STX supports a total of 256 addresses (0-255). The S1 switch on the STX PCB sets the STX's serial address. Table 2-1 shows how the switches are set in binary sequence for all 256 available addresses.

Address	S1 Switch Settings 1	2	3	4	5	6	7	8
0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0
2	0	1	0	0	0	0	0	0
3	1	1	0	0	0	0	0	0
4	0	0	1	0	0	0	0	0
5	1	0	1	0	0	0	0	0
6	0	1	1	0	0	0	0	0
7	1	1	1	0	0	0	0	0
8	0	0	0	1	0	0	0	0
9	1	0	0	1	0	0	0	0
10	0	1	0	1	0	0	0	0
11	1	1	0	1	0	0	0	0
12	0	0	1	1	0	0	0	0
13	1	0	1	1	0	0	0	0
14	0	1	1	1	0	0	0	0
15	1	1	1	1	0	0	0	0
16	0	0	0	0	1	0	0	0
17	1	0	0	0	1	0	0	0
18	0	1	0	0	1	0	0	0
19	1	1	0	0	1	0	0	0
20	0	0	1	0	1	0	0	0
21	1	0	1	0	1	0	0	0
22	0	1	1	0	1	0	0	0
23	1	1	1	0	1	0	0	0
24	0	0	0	1	1	0	0	0
25	1	0	0	1	1	0	0	0
26	0	1	0	1	1	0	0	0
27	1	1	0	1	1	0	0	0
28	0	0	1	1	1	0	0	0
29	1	0	1	1	1	0	0	0
30	0	1	1	1	1	0	0	0
31	1	1	1	1	1	0	0	0
32	0	0	0	0	0	1	0	0
33	1	0	0	0	0	1	0	0
34	0	1	0	0	0	1	0	0
35	1	1	0	0	0	1	0	0
36	0	0	1	0	0	1	0	0
37	1	0	1	0	0	1	0	0
38	0	1	1	0	0	1	0	0
39	1	1	1	0	0	1	0	0
40	0	0	0	1	0	1	0	0
41	1	0	0	1	0	1	0	0
42	0	1	0	1	0	1	0	0
43	1	1	0	1	0	1	0	0
44	0	0	1	1	0	1	0	0
45	1	0	1	1	0	1	0	0
46	0	1	1	1	0	1	0	0
47	1	1	1	1	0	1	0	0
48	0	0	0	0	1	1	0	0
49	1	0	0	0	1	1	0	0
50	0	1	0	0	1	1	0	0
51	1	1	0	0	1	1	0	0
52	0	0	1	0	1	1	0	0
53	1	0	1	0	1	1	0	0
54	0	1	1	0	1	1	0	0
55	1	1	1	0	1	1	0	0
56	0	0	0	1	1	1	0	0
57	1	0	0	1	1	1	0	0
58	0	1	0	1	1	1	0	0
59	1	1	0	1	1	1	0	0
60	0	0	1	1	1	1	0	0
61	1	0	1	1	1	1	0	0
62	0	1	1	1	1	1	0	0
63	1	1	1	1	1	1	0	0

Address	S1 Switch Settings 1	2	3	4	5	6	7	8
64	0	0	0	0	0	0	1	0
65	1	0	0	0	0	0	1	0
66	0	1	0	0	0	0	1	0
67	1	1	0	0	0	0	1	0
68	0	0	1	0	0	0	1	0
69	1	0	1	0	0	0	1	0
70	0	1	1	0	0	0	1	0
71	1	1	1	0	0	0	1	0
72	0	0	0	1	0	0	1	0
73	1	0	0	1	0	0	1	0
74	0	1	0	1	0	0	1	0
75	1	1	0	1	0	0	1	0
76	0	0	1	1	0	0	1	0
77	1	0	1	1	0	0	1	0
78	0	1	1	1	0	0	1	0
79	1	1	1	1	0	0	1	0
80	0	0	0	0	1	0	1	0
81	1	0	0	0	1	0	1	0
82	0	1	0	0	1	0	1	0
83	1	1	0	0	1	0	1	0
84	0	0	1	0	1	0	1	0
85	1	0	1	0	1	0	1	0
86	0	1	1	0	1	0	1	0
87	1	1	1	0	1	0	1	0
88	0	0	0	1	1	0	1	0
89	1	0	0	1	1	0	1	0
90	0	1	0	1	1	0	1	0
91	1	1	0	1	1	0	1	0
92	0	0	1	1	1	0	1	0
93	1	0	1	1	1	0	1	0
94	0	1	1	1	1	0	1	0
95	1	1	1	1	1	0	1	0
96	0	0	0	0	0	1	1	0
97	1	0	0	0	0	1	1	0
98	0	1	0	0	0	1	1	0
99	1	1	0	0	0	1	1	0
100	0	0	1	0	0	1	1	0
101	1	0	1	0	0	1	1	0
102	0	1	1	0	0	1	1	0
103	1	1	1	0	0	1	1	0
104	0	0	0	1	0	1	1	0
105	1	0	0	1	0	1	1	0
106	0	1	0	1	0	1	1	0
107	1	1	0	1	0	1	1	0
108	0	0	1	1	0	1	1	0
109	1	0	1	1	0	1	1	0
110	0	1	1	1	0	1	1	0
111	1	1	1	1	0	1	1	0
112	0	0	0	0	1	1	1	0
113	1	0	0	0	1	1	1	0
114	0	1	0	0	1	1	1	0
115	1	1	0	0	1	1	1	0
116	0	0	1	0	1	1	1	0
117	1	0	1	0	1	1	1	0
118	0	1	1	0	1	1	1	0
119	1	1	1	0	1	1	1	0
120	0	0	0	1	1	1	1	0
121	1	0	0	1	1	1	1	0
122	0	1	0	1	1	1	1	0
123	1	1	0	1	1	1	1	0
124	0	0	1	1	1	1	1	0
125	1	0	1	1	1	1	1	0
126	0	1	1	1	1	1	1	0
127	1	1	1	1	1	1	1	0

LEGEND: 0=Off, 1=On

Table 2-1. S1 Rocker-Arm Settings for STX Serial Address (continued on next page)

	S1 Switch Settings							
Address	1	2	3	4	5	6	7	8
128	0	0	0	0	0	0	0	1
129	1	0	0	0	0	0	0	1
130	0	1	0	0	0	0	0	1
131	1	1	0	0	0	0	0	1
132	0	0	1	0	0	0	0	1
133	1	0	1	0	0	0	0	1
134	0	1	1	0	0	0	0	1
135	1	1	1	0	0	0	0	1
136	0	0	0	1	0	0	0	1
137	1	0	0	1	0	0	0	1
138	0	1	0	1	0	0	0	1
139	1	1	0	1	0	0	0	1
140	0	0	1	1	0	0	0	1
141	1	0	1	1	0	0	0	1
142	0	1	1	1	0	0	0	1
143	1	1	1	1	0	0	0	1
144	0	0	0	0	1	0	0	1
145	1	0	0	0	1	0	0	1
146	0	1	0	0	1	0	0	1
147	1	1	0	0	1	0	0	1
148	0	0	1	0	1	0	0	1
149	1	0	1	0	1	0	0	1
150	0	1	1	0	1	0	0	1
151	1	1	1	0	1	0	0	1
152	0	0	0	1	1	0	0	1
153	1	0	0	1	1	0	0	1
154	0	1	0	1	1	0	0	1
155	1	1	0	1	1	0	0	1
156	0	0	1	1	1	0	0	1
157	1	0	1	1	1	0	0	1
158	0	1	1	1	1	0	0	1
159	1	1	1	1	1	0	0	1
160	0	0	0	0	0	1	0	1
161	1	0	0	0	0	1	0	1
162	0	1	0	0	0	1	0	1
163	1	1	0	0	0	1	0	1
164	0	0	1	0	0	1	0	1
165	1	0	1	0	0	1	0	1
166	0	1	1	0	0	1	0	1
167	1	1	1	0	0	1	0	1
168	0	0	0	1	0	1	0	1
169	1	0	0	1	0	1	0	1
170	0	1	0	1	0	1	0	1
171	1	1	0	1	0	1	0	1
172	0	0	1	1	0	1	0	1
173	1	0	1	1	0	1	0	1
174	0	1	1	1	0	1	0	1
175	1	1	1	1	0	1	0	1
176	0	0	0	0	1	1	0	1
177	1	0	0	0	1	1	0	1
178	0	1	0	0	1	1	0	1
179	1	1	0	0	1	1	0	1
180	0	0	1	0	1	1	0	1
181	1	0	1	0	1	1	0	1
182	0	1	1	0	1	1	0	1
183	1	1	1	0	1	1	0	1
184	0	0	0	1	1	1	0	1
185	1	0	0	1	1	1	0	1
186	0	1	0	1	1	1	0	1
187	1	1	0	1	1	1	0	1
188	0	0	1	1	1	1	0	1
189	1	0	1	1	1	1	0	1
190	0	1	1	1	1	1	0	1
191	1	1	1	1	1	1	0	1

	S1 Switch Settings							
Address	1	2	3	4	5	6	7	8
192	0	0	0	0	0	0	1	1
193	1	0	0	0	0	0	1	1
194	0	1	0	0	0	0	1	1
195	1	1	0	0	0	0	1	1
196	0	0	1	0	0	0	1	1
197	1	0	1	0	0	0	1	1
198	0	1	1	0	0	0	1	1
199	1	1	1	0	0	0	1	1
200	0	0	0	1	0	0	1	1
201	1	0	0	1	0	0	1	1
202	0	1	0	1	0	0	1	1
203	1	1	0	1	0	0	1	1
204	0	0	1	1	0	0	1	1
205	1	0	1	1	0	0	1	1
206	0	1	1	1	0	0	1	1
207	1	1	1	1	0	0	1	1
208	0	0	0	0	1	0	1	1
209	1	0	0	0	1	0	1	1
210	0	1	0	0	1	0	1	1
211	1	1	0	0	1	0	1	1
212	0	0	1	0	1	0	1	1
213	1	0	1	0	1	0	1	1
214	0	1	1	0	1	0	1	1
215	1	1	1	0	1	0	1	1
216	0	0	0	1	1	0	1	1
217	1	0	0	1	1	0	1	1
218	0	1	0	1	1	0	1	1
219	1	1	0	1	1	0	1	1
220	0	0	1	1	1	0	1	1
221	1	0	1	1	1	0	1	1
222	0	1	1	1	1	0	1	1
223	1	1	1	1	1	0	1	1
224	0	0	0	0	0	1	1	1
225	1	0	0	0	0	1	1	1
226	0	1	0	0	0	1	1	1
227	1	1	0	0	0	1	1	1
228	0	0	1	0	0	1	1	1
229	1	0	1	0	0	1	1	1
230	0	1	1	0	0	1	1	1
231	1	1	1	0	0	1	1	1
232	0	0	0	1	0	1	1	1
233	1	0	0	1	0	1	1	1
234	0	1	0	1	0	1	1	1
235	1	1	0	1	0	1	1	1
236	0	0	1	1	0	1	1	1
237	1	0	1	1	0	1	1	1
238	0	1	1	1	0	1	1	1
239	1	1	1	1	0	1	1	1
240	0	0	0	0	1	1	1	1
241	1	0	0	0	1	1	1	1
242	0	1	0	0	1	1	1	1
243	1	1	0	0	1	1	1	1
244	0	0	1	0	1	1	1	1
245	1	0	1	0	1	1	1	1
246	0	1	1	0	1	1	1	1
247	1	1	1	0	1	1	1	1
248	0	0	0	1	1	1	1	1
249	1	0	0	1	1	1	1	1
250	0	1	0	1	1	1	1	1
251	1	1	0	1	1	1	1	1
252	0	0	1	1	1	1	1	1
253	1	0	1	1	1	1	1	1
254	0	1	1	1	1	1	1	1
255	1	1	1	1	1	1	1	1

LEGEND: 0=Off, 1=On

Table 2-1. S1 Rocker-Arm Settings for STX Serial Address (continued from previous page)

Chapter 3. Stand-Alone STX Analog Calibration and Setup

Introduction

This chapter contains the procedures to perform an analog calibration, set up system parameters for the STX, and use the STX's remote tare feature.

Analog Calibration

Analog calibration calibrates the STX's 'analog engine' with the sensors wired to the STX (for example, L-Cells, Microcells, Load Stand II, Load Disc II, or Load Link):

- When the STX is in Analog Mode, the current output transmitted by the STX PCB is based on the analog calibration. However, any digital outputs (such as to an MVS or PLC) are based on the digital calibration.
- When the STX is in Digital Mode, the current output transmitted by the STX PCB and any digital outputs (such as to an MVS or PLC) are based on the digital calibration.

The calibration described in this chapter is valid only when the STX is in Analog Mode. If the STX is in Digital Mode, the STX will ignore the analog calibration. Refer to the appropriate reference for digital calibration:

- Chapter 7, MVS-STX Calibration Menu
- Appendix B, Serial Commands
- Applicable PLC manual — *KM-RIO Installation and Operation Manual*, *MVS-RIO Installation and Operation Manual*, or *MVS-Modbus Installation and Operation Manual*

Note

Before performing analog calibration, you must set up the current output mode (0-20 or 4-20 mA). See *Setting Up Current Output Operating Mode*.

Setting Up Current Output Operating Mode (0-20 or 4-20 mA)

Note

The default mode is 4-20 mA. If that is the desired mode of operation, skip this section and proceed to *Analog Calibration*.

The STX's current transmitter can be set up to output 0-20 mA or 4-20 mA. The 0-20 mode has a minimum current output of 0 mA and a maximum output of 20 mA. The 4-20 mode has a minimum current output of 4 mA and a maximum output of 20 mA. Follow this procedure to select the operating mode:

1. If the STX is off, apply power and let it warm up for at least 15 minutes.
2. Place SW3 in the position corresponding to the desired mode of operation, 0-20 or 4-20 mA.
3. **Immediately** after placing SW3 in the desired position, press SW1 and SW2 simultaneously to enter the selected mode in memory.

Note

If you do not press SW1 and SW2 within 15 seconds of placing SW3 in the desired position, the STX disables SW1 and SW2. If this occurs, move SW3 out of and back into the desired position and repeat Step 3.

Analog Calibration

There are three methods for performing an analog calibration:

- High-accuracy calibration
- Calibration by adding a known quantity of material
- Calibration by subtracting a known quantity of material

Each method requires moving a known quantity of material into or out of the vessel. The high-accuracy calibration requires the vessel be completely empty to start, and be filled to maximum capacity during the calibration. The latter two methods do not provide as high accuracy calibration as the first method. However, they provide a good start for using the STX. If you need to increase the accuracy, perform a high-accuracy calibration at a later date, when you have an empty vessel.

Before starting calibration, connect an ammeter to the STX. Refer to Figure 3-1 and TI-SP.STX-02 (stand-alone), TI-SP.STX-03 (standard 19" rack), or TI-MVS.STX-01 (MVS-STX) in Appendix H.

- If a current monitoring device is connected to Iout, connect an ammeter in series with the device.
- If a monitoring device is not being used, connect the ammeter positive (+) lead to +Iout. Connect the negative (-) lead to -Iout.

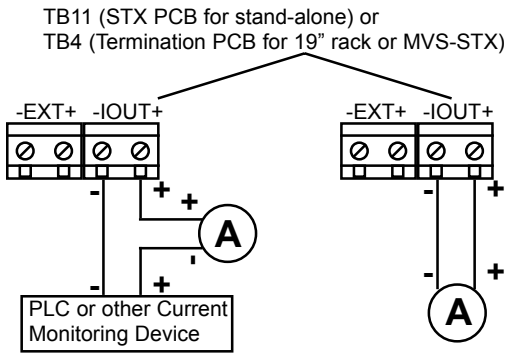


Figure 3-1. Two Methods for Connecting Ammeter

High-Accuracy Calibration

This procedure provides the highest accuracy, but requires the vessel be completely empty to start. The principle behind the calibration follows.

The vessel is completely emptied, and Zero [point (1) in Figure 3-2] is set to the low current output (4 mA or 0 mA). A known quantity of material, equalling the vessel's total capacity, is added to the vessel. Span [point (2) in Figure 3-2] is set to the 20 mA current output. The STX saves in memory the current outputs as well as the digital counts associated with them. These values define the straight line shown in Figure 3-2. The slope of the line is called the Scale Factor, which is calculated internally.

Follow this procedure to perform a high-accuracy calibration:

1. Completely empty the vessel.
2. If the STX is off, apply power and let it warm up for at least 15 minutes.
3. Place SW3 in the Zero position.
4. **Immediately** after placing SW3 in the Zero position, press and hold SW2 (Down) or SW1 (Up) until the ammeter shows 4 mA (4-20 mode) or 0 mA (0-20 mode). When you release the switch the milliamp value is entered in memory.

Note

If you do not press SW1 or SW2 within 15 seconds of placing SW3 in the desired position, the STX disables SW1 and SW2. If this occurs, move SW3 out of and back into the desired position and repeat the step.

5. Fill the vessel to its maximum capacity.
6. Place SW3 in the Span position.
7. **Immediately** after placing SW3 in the Span position, press and hold SW1 (Up) or SW2 (Down) until the ammeter shows 20 mA. When you release the switch the milliamp value is entered in memory.

Analog calibration is complete.

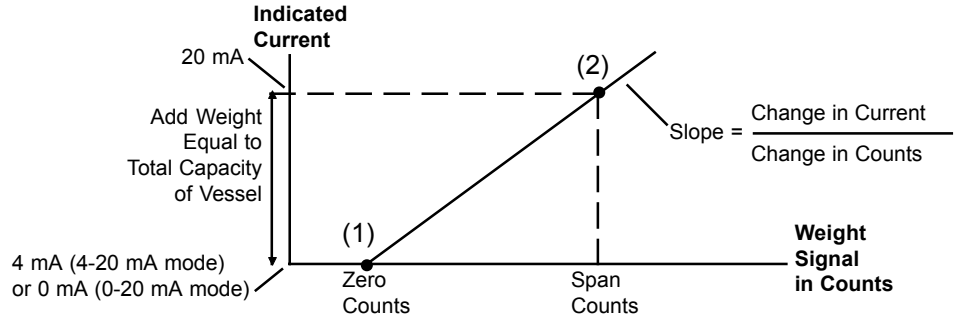


Figure 3-2. High-Accuracy Calibration

Calibration by Adding a Known Quantity of Material

This calibration method does not require the vessel to be completely empty. The principle follows.

Zero [point (1) in Figure 3-3] is set to the low current output (4 mA or 0 mA). A known quantity of material, representing at least 25% of the vessel's total capacity, is added to the vessel. Span [point (2) in Figure 3-3] is set to a current output proportional to the **change** in weight. Points 1 and 2 define the dashed straight line. The slope of the line is called the Scale Factor, which is calculated internally. Zero [point (3) in Figure 3-3] is then set to a current output proportional to the estimated amount of material in the vessel, adjusting the 'location' of the line to the solid line.

The calibration is reasonably accurate, because it is based on the known difference between the currents (based on the difference in weights) and counts. However, if the estimated weight is incorrect, the actual 'location' of the line is incorrect, resulting in errors in output. The greater the error in the estimated weight, the greater the resulting error.

The accuracy of the calibration improves the greater the known quantity of material added during the calibration procedure. For example, adding 50% of the vessel's total capacity results in greater accuracy than adding 25% of the total capacity.

Example: Operating in 4-20 mA mode, maximum vessel live load = 100,000 lbs, current live load = 25,000 lbs.

1. Input Zero point as 4 mA.
2. Add 50,000 lbs to vessel.
3. **Change in weight** as percentage of maximum live load
   = 50,000/100,000 = 50%,
   corresponding to 12 mA from Table 3-1.
4. Input Span point as 12 mA.
5. **Estimated current live load** as percentage of maximum live load
   = (25,000 + 50,000)/100,000 = 75%,
   corresponding to 16 mA from Table 3-1.
6. Input Zero point as 16 mA.

Analog calibration is complete.

0-20 mA Mode		4-20 mA Mode	
Current Output (mA)	**% of Maximum Live Load**	**Current Output (mA)**	**% of Maximum Live Load**
0	0	4	0
1	5	5	6.25
2	10	6	12.5
3	15	7	18.75
4	20	8	25
5	25	9	31.25
6	30	10	37.5
7	35	11	43.75
8	40	12	50
9	45	13	56.25
10	50	14	62.5
11	55	15	68.75
12	60	16	75
13	65	17	81.25
14	70	18	87.5
15	75	19	93.75
16	80	20	100
17	85		
18	90		
19	95		
20	100		

Table 3-1. Proportional Current Outputs

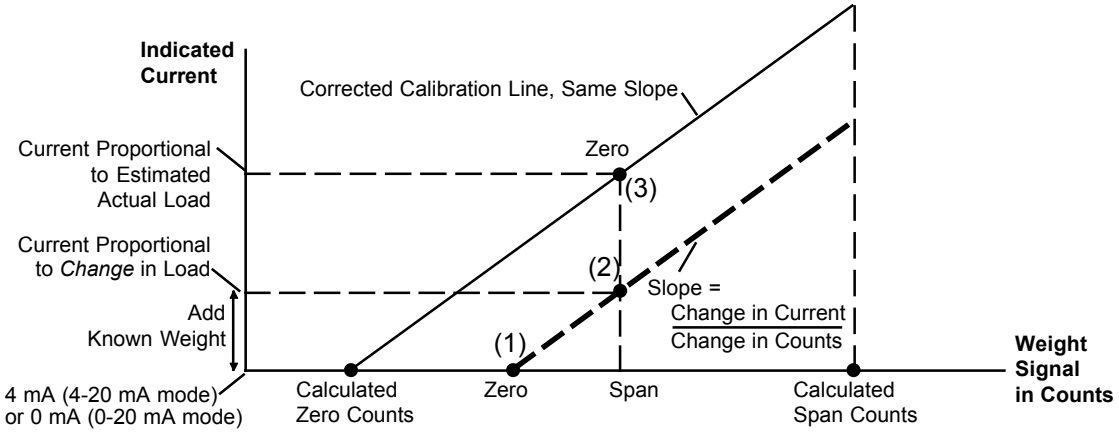


Figure 3-3. Calibration by Adding a Known Quantity of Material

Follow this procedure to calibrate by adding a known quantity of material:

1. If the STX is off, apply power and let it warm up for at least 15 minutes.
2. Place SW3 in the Zero position.
3. Refer to Table 3-1. **Immediately** after placing SW3 in the Zero position, press and hold SW2 (Down) or SW1 (Up) until the ammeter shows 4 mA (4-20 mode) or 0 mA (0-20 mode). When you release the switch the milliamp value is entered in memory.

Note

If you do not press SW1 or SW2 within 15 seconds of placing SW3 in the desired position, the STX disables SW1 and SW2. If this occurs, move SW3 out of and back into the desired position and repeat the step.

4. Add a known quantity of material, representing at least 25% of the vessel's total capacity, to the vessel.
5. Place SW3 in the Span position.
6. Refer to Table 3-1. **Immediately** after placing SW3 in the Span position, press and hold SW1 (Up) or SW2 (Down) until the ammeter shows a current **proportional to the change in weight**. When you release the switch the milliamp value is entered in memory.
7. Place SW3 in the Zero position.
8. Refer to Table 3-1. **Immediately** after placing SW3 in the Zero position, press and hold SW1 (Up) or SW2 (Down) until the ammeter shows a current **proportional to the current live load**. When you release the switch the milliamp value is entered in memory.

Analog calibration is complete.

Calibration by Subtracting a Known Quantity of Material

This calibration method does not require the vessel to be empty. This method is appropriate when it is easier to remove material from the vessel than to add it.

The principle is similar to that for calibrating by adding a known quantity of material. However, the procedure requires you to first reverse the excitation (half-bridge sensors) or input (full-bridge sensors). Zero [point (1) in Figure 3-3] is set to the low current output (4 mA or 0 mA). A known quantity of material, representing at least 25% of the vessel's total capacity, is removed from the vessel. Span [point (2) in Figure 3-3] is set to a current output proportional to the **change** in weight. Points 1 and 2 define the dashed straight line. The slope of the line is called the Scale Factor, which is calculated internally. The sensor excitation (half-bridge sensors) or input (full-bridge sensors) is then returned to the normal setting. Zero [point (3) in Figure 3-3] is then set to a current output proportional to the estimated amount of material in the vessel, adjusting the 'location' of the line to the solid line.

The calibration is reasonably accurate, because it is based on the known difference between the currents (based on the difference in weights) and counts. However, if the estimated weight is incorrect, the actual 'location' of the line is incorrect, resulting in errors in output. The greater the error in the estimated weight, the greater the resulting error.

The accuracy of the calibration improves the greater the known quantity of material moved during the calibration procedure. For example, removing 50% of the total capacity results in greater accuracy than removing 25% of the total capacity.

Example: Half-bridge sensors, operating in 4-20 mA mode, maximum vessel live load = 100,000 lbs, current live load = 75,000 lbs.

1. Reverse excitation.
2. Input Zero point as 4 mA
3. Remove 50,000 lbs from vessel.
4. **Change in weight** as percentage of maximum live load
   = 50,000/100,000 = 50%,
   corresponding to 12 mA from Table 3-1.
5. Input Span point as 12 mA.
6. Return excitation to normal.
7. **Estimated current live load** as percentage of maximum live load
   = (75,000 - 50,000)/100,000 = 25%,
   corresponding to 8 mA from Table 3-1.
8. Input Zero point as 8 mA.

Analog calibration is complete.

Follow this procedure to calibrate by subtracting a known quantity of material:

1. Disconnect power from the STX.
2. See TI-SP.STX-02 (stand-alone), TI-SP.STX-03 (standard 19" rack), or TI-MVS.STX-01 (MVS-STX) in Appendix H:
   - Half-bridge (K-M) sensors — reverse excitation (switch black and red sensor wires on -EX and +EX).
   - Full-bridge sensors — reverse input (switch input wires on -IN1 and +IN1).

3. Apply power and let the STX warm up for at least 15 minutes.
4. Place SW3 in the Zero position.
5. Refer to Table 3-1. **Immediately** after placing SW3 in the Zero position, press and hold SW2 (Down) or SW1 (Up) until the ammeter shows 4 mA (4-20 mode) or 0 mA (0-20 mode). When you release the switch the milliamp value is entered in memory.

Note

If you do not press SW1 or SW2 within 15 seconds of placing SW3 in the desired position, the STX disables SW1 and SW2. If this occurs, move SW3 out of and back into the desired position and repeat the step.

6. Remove a known quantity of material, representing at least 25% of the vessel's total capacity, from the vessel.
7. Place SW3 in the Span position.
8. Refer to Table 3-1. **Immediately** after placing SW3 in the Span position, press and hold SW1 (Up) or SW2 (Down) until the ammeter shows a current **proportional to the change in weight**. When you release the switch the milliamp value is entered in memory.
9. Disconnect power from the STX.
10. Return excitation (half-bridge sensors) or input (full-bridge sensors) to normal.
11. Apply power and let the STX warm up for at least 15 minutes.
12. Place SW3 in the Zero position.
13. Refer to Table 3-1. **Immediately** after placing SW3 in the Zero position, press and hold SW1 (Up) or SW2 (Down) until the ammeter shows a current **proportional to the current live load**. When you release the switches the milliamp value is entered in memory.

Analog calibration is complete.

System Setup

The STX allows you to set up system parameters using the S1 dipswitch on the STX PCB (see TI-SP.STX-02 in Appendix H). This provides the ability to set up the system without the use of an external device, such as an MVS, PLC, etc. Note that any parameters entered using the dipswitch apply to both analog and digital outputs from the STX. The S1 dipswitch is used to set up the following parameters:

- Averaging factor
- Amplifier gain
- Effective resolution
- Analog current output
  - — Fail-safe mode
  - — Net/gross mode
  - — Polarity
- Analog/digital mode
- Serial port baud rate
- Excitation voltage
- DSP filter
  - — Filter on/off
  - — DSP factor
  - — Filter step
  - — Qualify factor
- Material/zero tracking
  - — Zero tracking window
  - — Tracking rate
  - — Material tracking on/off

Setting Up the Parameter describes the procedure for inputting a parameter value. *Descriptions* describes the effect of each parameter on STX operation and lists the available selections.

Note

Do not set up a parameter if its factory default is the desired selection.

Setting Up the Parameter

The positions of rocker arm switches DS5 through DS8 on the S1 dipswitch determine which parameter is set up, as summarized in Table 3-2. The positions of rocker arm switches DS1 through DS4 determine the parameter value. Tables 3-3 through 3-18 in the *Descriptions* section show the rocker arm positions (DS1 through DS8) for each parameter.

For example, to enter an averaging factor of 10:

- Set DS5 through DS8 to Off (see Table 3-2 or Table 3-3) to indicate the parameter is 'averaging factor.'
- Set DS1 and DS2 to On and DS3 and DS4 to Off (see Table 3-3) to indicate the averaging factor is 10.

DS8	DS7	DS6	DS5	Parameter
0	0	0	0	Averaging Factor
0	0	0	1	Amplifier Gain
0	0	1	0	Effective Resolution
0	0	1	1	Fail-Safe Mode (Analog current output)
0	1	0	0	Net/Gross Mode (Analog current output)
0	1	0	1	Polarity (Analog current output)
0	1	1	0	Analog/Digital Mode
0	1	1	1	Serial Port Baud Rate
1	0	0	0	Excitation Voltage
1	0	0	1	Filter On/Off (DSP filter)
1	0	1	0	DSP Factor (DSP filter)
1	0	1	1	Filter Step (DSP filter)
1	1	0	0	Qualify Factor (DSP filter)
1	1	0	1	Zero Tracking Window (Material/zero tracking)
1	1	1	0	Tracking Rate (Material/zero tracking)
1	1	1	1	Material Tracking On/Off (Material/zero tracking)

1 = on, 0 = off

Table 3-2. Dipswitch Settings to Select Parameter

Follow this procedure to set up a parameter:

Note

If the STX is set up to serial communicate with another device, serial communications are interrupted during the procedure, due to the movement of the switches on the S1 dipswitch.

1. Remove the jumper from the JP1 Aux pins and place it on the JP2 Factory pins.
2. See the appropriate table (Table 3-3 through 3-18) for the parameter. Set switches DS1 through DS8 on the S1 dipswitch in the positions for the desired parameter and value.
3. To enter the parameter and value into memory:
   A. Remove the JP3 jumper from the Wdog position and briefly place it in the Pgm (program) position.
   B. Remove the jumper from the Pgm position. The Status LED will illuminate for approximately 1 second after you remove the jumper from the Pgm position, confirming the new value is entered in memory.
   C. Replace the jumper in the Wdog position.
4. Repeat Steps 2 and 3 for each parameter you want to set up.
5. Remove the jumper from the JP2 Factory pins and put it back on the JP1 Aux pins. The STX is ready for operation.

Note

If the STX is set up to serially communicate with another device, reset DS1 through DS8 on the S1 dipswitch to the serial address positions to reinstate serial communications.

Descriptions

Averaging Factor

This parameter sets the number of readings (from 1 to 255) the STX averages for each output. The STX calculates a running average. The larger the number of readings in the running average, the smaller effect a variation in signal has on the average. This results in fewer variations in output (for example, fewer variations in a display reading, providing an easier to read display). The averaging factor affects the value seen on a display as well as current outputs and serial outputs. The default is 1.

Refer to Table 3-3 for the positions of DS1 through DS8 and then follow the procedure in *Setting Up the Parameter*.

DS4	DS3	DS2	DS1	Averaging Factor
0	0	0	0	1*
0	0	0	1	2
0	0	1	0	5
0	0	1	1	10
0	1	0	0	15
0	1	0	1	20
0	1	1	0	25
0	1	1	1	35
1	0	0	0	50
1	0	0	1	75
1	0	1	0	100
1	0	1	1	125
1	1	0	0	150
1	1	0	1	175
1	1	1	0	200
1	1	1	1	255

1 = on, 0 = off, * = default

Note: To select Averaging Factor, set dipswitches DS5 through DS8: DS8 = 0, DS7 = 0, DS6 = 0, DS5 = 0.

Table 3-3. Averaging Factor Dipswitch Settings

Amplifier Gain

Adjusting the amplifier gain increases or decreases system sensitivity. The type of sensors connected to the STX determines the required gain. For example, for a nominal excitation output of 12 volts, the reference voltage is one quarter of the excitation voltage, or 3 volts. At a gain of 1, the A/D converter spreads 2,097,152 counts over a range of ± 3 volts. A gain of 2 spreads the counts over a range of ± 1.5 volts, doubling the sensitivity. A gain of 4 spreads the counts over a range of ± 0.75 volts, doubling the sensitivity again, etc.

The default gain is 2, appropriate for K-M Microcell and L-Cell sensors. A gain of 4 is appropriate for K-M Load Disc II, Load Stand II, and Load Link I and II sensors.

Refer to Table 3-4 for the positions of DS1 through DS8 and then follow the procedure in *Setting Up the Parameter*.

DS4	DS3	DS2	DS1	Amplifier Gain	Sensor Input Voltage
x	0	0	0	2*	±1.5
x	0	0	1	1	±3.0
x	0	1	0	4	±0.75
x	0	1	1	8	±0.375
x	1	0	0	16	±0.1875
x	1	0	1	32	±0.09375
x	1	1	0	64	±0.046875
x	1	1	1	128	±0.0234375

1 = on, 0 = off, x = does not matter, * = default
Note: To select Amplifier Gain, set dipswitches DS5 through DS8: DS8 = 0, DS7 = 0, DS6 = 0, DS5 = 1.

Table 3-4. Amplifier Gain Dipswitch Settings

Effective Resolution

This parameter controls effective resolution by changing the conversion rate of the 21-bit A/D converter. In general, the higher the resolution, the slower the STX conversion time but the greater the stability.

Refer to Table 3-5 for the positions of DS1 through DS8 and then follow the procedure in *Setting Up the Parameter.*

DS4	DS3	DS2	DS1	Effective Res. (bits)	Conversion Time (mS)	Conversion Rate (Conv/s)
x	0	0	0	21	512	2
x	0	0	1	20	250	4*
x	0	1	0	19	125	8
x	0	1	1	18	83	12
x	1	0	0	17	50	20
x	1	0	1	16	25	40

1 = on, 0 = off, x = does not matter, * = default
Note: To select Effective Resolution, set dipswitches DS5 through DS8: DS8 = 0, DS7 = 0, DS6 = 1, DS5 = 0.

Table 3-5. Effective Resolution Dipswitch Settings

Analog Current Output

Fail-Safe Mode

If the STX detects a problem, one of three fail-safe *(Fsafe)* conditions can be applied to the analog current output:

- Lo
- Hi
- NC (no change)

Lo forces the current output to 0 (in 0-20 mA operating mode) or 4 mA (in 4-20 mA operating mode) in a fail-safe condition. *Hi* forces the output to 20 mA. *NC* makes no change to the current output in a fail-safe condition (i.e., what was being transmitted before the problem was detected will continue to be transmitted). A fail-safe condition remains in effect until the problem has been corrected.

Following are examples of fail-safe conditions:

- Analog-to-digital converter overrange/ underrange condition
- Engineering units overrange
- Communication error with the STX PCB or with a serial device

Refer to Table 3-6 for the positions of DS1 through DS8 and then follow the procedure in *Setting Up the Parameter*.

DS4	DS3	DS2	DS1	Fail-Safe Mode
x	x	0	0	Lo (0/4 mA)
x	x	0	1	Hi (20 mA)
x	x	1	0	NC (no change)*

1 = on, 0 = off, x = does not matter, * = default
Note: To select Fail-Safe Mode, set dipswitches DS5 through DS8: DS8 = 0, DS7 = 0, DS6 = 1, DS5 = 1.

Table 3-6. Analog Current Output Fail-Safe Mode Dipswitch Settings

Net/Gross Mode

The analog current transmitter may be set to transmit current output based on either the net weight or gross weight.

Refer to Table 3-7 for the positions of DS1 through DS8 and then follow the procedure in *Setting Up the Parameter*.

DS4	DS3	DS2	DS1	Net/Gross Mode
x	x	x	0	Gross*
x	x	x	1	Net

1 = on, 0 = off, x = does not matter, * = default
Note: To select Net/Gross Mode, set dipswitches DS5 through DS8: DS8 = 0, DS7 = 1, DS6 = 0, DS5 = 0.

Table 3-7. Analog Current Output Net/Gross Mode Dipswitch Settings

Polarity (Batch In/Out)

The STX's current transmitter may be set to increase current output with increasing signal input (most often used) or decrease current output with increasing signal input.

Refer to Table 3-8 for the positions of DS1 through DS8 and then follow the procedure in *Setting Up the Parameter*.

DS4	DS3	DS2	DS1	0/4-20 Polarity
x	x	x	0	A/D Input Increasing (Batch In)*
x	x	x	1	A/D Input Decreasing (Batch Out)

1 = on, 0 = off, x = does not matter, * = default
Note: To select Polarity, set dipswitches DS5 through DS8: DS8 = 0, DS7 = 1, DS6 = 0, DS5 = 1.

Table 3-8. Analog Current Output Polarity Dipswitch Setting

Note

If you set Polarity to **Decreasing** and later need to recalibrate the STX, temporarily set Polarity to **Increasing** before you recalibrate. After recalibration is complete, reset Polarity to Decreasing.

Analog/Digital Mode

The STX can be set up to operate in the analog or the digital operating mode:

- Analog Mode — current output transmitted by STX PCB is based on analog calibration, detailed in the *Analog Calibration* section in this chapter.
- Digital Mode — current output transmitted by STX PCB is based on digital calibration (performed using MVS menu tree or serial commands, as applicable).

Note

If an MVS or other serial device is communicating with the STX, other outputs (for example, setpoints, current outputs from the MVS's Current Output PCB, and serial communications) are based on the digital calibration, regardless of which mode is selected.

Refer to Table 3-9 for the positions of DS1 through DS8 and then follow the procedure in *Setting Up the Parameter*.

DS4	DS3	DS2	DS1	Mode
x	x	x	0	Analog*
x	x	x	1	Digital

1 = on, 0 = off, x = does not matter, * = default
Note: To select Analog/Digital Mode, set dipswitches DS5 through DS8: DS8 = 0, DS7 = 1, DS6 = 1, DS5 = 0.

Table 3-9. Analog/Digital Mode Dipswitch Settings

Serial Port Baud Rate

The serial port baud rate determines the speed with which the STX communicates with the MVS, PLC, etc.

Refer to Table 3-10 for the positions of DS1 through DS8 and then follow the procedure in *Setting Up the Parameter*.

DS4	DS3	DS2	DS1	Baud Rate
x	0	0	0	1200
x	0	0	1	2400
x	0	1	0	4800
x	0	1	1	9600*
x	1	0	0	19200

1 = on, 0 = off, x = does not matter, * = default
Note: To select Baud Rate, set dipswitches DS5 through DS8: DS8 = 0, DS7 = 1, DS6 = 1, DS5 = 1.

Table 3-10. Serial Port Baud Rate Dipswitch Settings

Excitation Voltage

This parameter adjusts the STX's excitation voltage output, which is used to excite the sensors. The default is 12 Volts, appropriate for K-M silicon sensors without Intrinsically Safe (IS) Barriers. Foil gage sensors typically require 10 Volts of excitation; refer to the manufacturer's data sheet for recommended excitation.

Note

If using IS Barriers, it may be necessary to lower the excitation voltage.

Refer to Table 3-11 for the positions of DS1 through DS8 and then follow the procedure in *Setting Up the Parameter*. Note that the excitation voltages shown in the table are under nominal line conditions.

DS4	DS3	DS2	DS1	Excitation Volts
0	0	0	0	12.5
0	0	0	1	12*
0	0	1	0	11.5
0	0	1	1	11
0	1	0	0	10.5
0	1	0	1	10
0	1	1	0	9.5
0	1	1	1	9
1	0	0	0	8.5
1	0	0	1	8
1	0	1	0	7.5
1	0	1	1	7
1	1	0	0	6.5
1	1	0	1	6
1	1	1	0	5.5
1	1	1	1	5

1 = on, 0 = off, * = default
Note: To select Excitation Voltage, set dipswitches DS5 through DS8: DS8 = 1, DS7 = 0, DS6 = 0, DS5 = 0.

Table 3-11. Excitation Voltage Dipswitch Settings

DSP Filter

Vibrations in a vessel can cause changes in the STX's output, even though no material is moved, because the vibrations affect the vessel's structural response. The **Sentry™** DSP Filter reduces output changes that can result from vibration. The principle behind the filtering follows.

The A/D converter digitizes the signal coming from a sensor. The STX picks the first signal as a reference median; this value is used in calculating the output. As shown in Figure 3-4, the STX then compares following signals to the reference median, and recalculates the reference median when either of the following happen:

- the number of successive signals above or below the median exceeds a triggering number
- a signal falls outside a user-defined window around the reference median

When the STX recalculates the reference median, the transmitted data changes to correspond to the new reference median. The DSP Filter affects the STX's current output as well as serial output to an MVS or other serial device.

The DSP Filter has four parameters to define its operation: Filter On/Off, DSP Factor, Filter Step, and Qualify Factor.

Filter On/Off

This turns the DSP filter on and off.

Refer to Table 3-12 for the positions of DS1 through DS8 and then follow the procedure in *Setting Up the Parameter*.

DS4	DS3	DS2	DS1	Filter On/Off
x	x	x	0	On
x	x	x	1	Off*

1 = on, 0 = off, x = does not matter, * = default
Note: To select Filter On/Off, set dipswitches DS5 through DS8: DS8 = 1, DS7 = 0, DS6 = 0, DS5 = 1.

Table 3-12. DSP Filter On/Off Dipswitch Settings

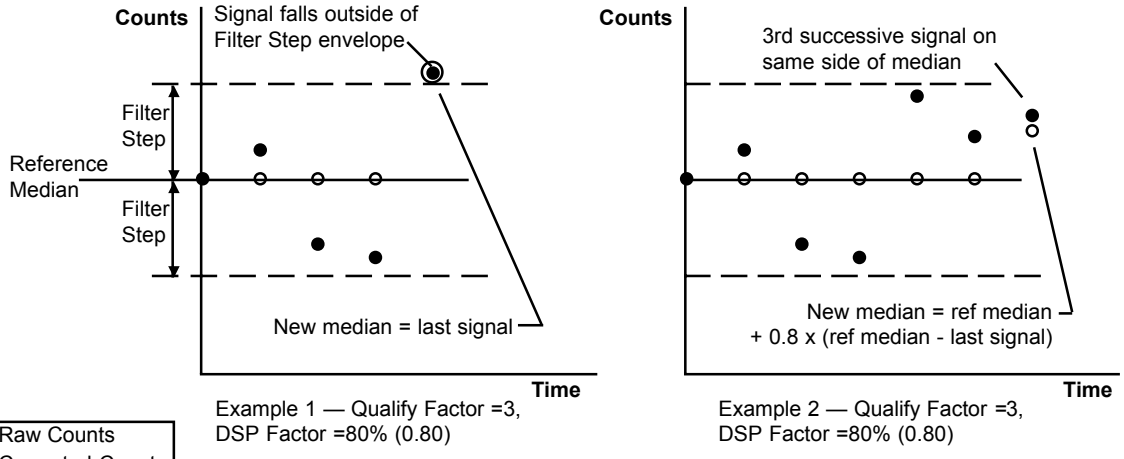


Figure 3-4. DSP Filter Examples

DSP Factor

The DSP Factor determines the magnitude of change from the old to the new reference median, for change triggered by the Qualify Factor. In example 2 in Figure 3-4, the STX moves the reference median 80% of the distance from the old median to the last signal (which triggered the change), based on a DSP Factor of 80%. A value of 100% sets the new median to the last signal value; a value of 50% sets the new median halfway between the old median and the last signal value. Note that DSP Factor does not affect the change caused by a signal falling outside the Filter Step window, as shown in example 1 in Figure 3-4.

Refer to Table 3-13 for the positions of DS1 through DS8 and then follow the procedure in *Setting Up the Parameter*.

DS4	DS3	DS2	DS1	DSP Factor (%)
0	0	0	0	99
0	0	0	1	95
0	0	1	0	90
0	0	1	1	85
0	1	0	0	80*
0	1	0	1	75
0	1	1	0	70
0	1	1	1	65
1	0	0	0	60
1	0	0	1	55
1	0	1	0	50
1	0	1	1	45
1	1	0	0	35
1	1	0	1	25
1	1	1	0	10
1	1	1	1	5

1 = on, 0 = off, * = default
Note: To select DSP Factor, set dipswitches DS5 through DS8: DS8 = 1, DS7 = 0, DS6 = 1, DS5 = 0.

Table 3-13. DSP Filter
DSP Factor Dipswitch Settings

Filter Step

The Filter Step is a window of equal counts above and below the reference median. As shown in Figure 3-4, example 1, if a large signal change is detected that falls outside of the window, the STX immediately moves the location of the reference median to that point. This allows the STX to adjust quickly to rapid material movement.

Refer to Table 3-14 for the positions of DS1 through DS8 and then follow the procedure in *Setting Up the Parameter*.

DS4	DS3	DS2	DS1	Filter Step
0	0	0	0	1
0	0	0	1	2
0	0	1	0	5
0	0	1	1	10
0	1	0	0	15
0	1	0	1	20
0	1	1	0	25
0	1	1	1	35
1	0	0	0	50
1	0	0	1	75
1	0	1	0	100
1	0	1	1	125
1	1	0	0	150*
1	1	0	1	175
1	1	1	0	200
1	1	1	1	255

1 = on, 0 = off, * = default
Note: To select Filter Step, set dipswitches DS5 through DS8: DS8 = 1, DS7 = 0, DS6 = 1, DS5 = 1.

Table 3-14. DSP Filter
Filter Step Dipswitch Settings

Qualify Factor

The Qualify Factor is the triggering number of successive signals above or below the median signal value, but within the Filter Step window. In example 2 in Figure 3-4, the Qualify Factor is 3. When the third successive signal above the median value (but within the Filter Step window) is detected, the STX moves the location of the median value to that point or a percentage of the distance from the old median as determined by DSP Factor. This allows the STX to respond to definite trends in weight changes.

Refer to Table 3-15 for the positions of DS1 through DS8 and then follow the procedure in *Setting Up the Parameter*.

DS4	DS3	DS2	DS1	Qualify Factor
0	0	0	0	2
0	0	0	1	3*
0	0	1	0	4
0	0	1	1	5
0	1	0	0	6
0	1	0	1	7
0	1	1	0	8
0	1	1	1	9
1	0	0	0	10
1	0	0	1	11
1	0	1	0	12
1	0	1	1	13
1	1	0	0	20
1	1	0	1	30
1	1	1	0	60
1	1	1	1	120

1 = on, 0 = off, * = default
Note: To select Qualify Factor, set dipswitches DS5 through DS8: DS8 = 1, DS7 = 1, DS6 = 0, DS5 = 0.

Table 3-15. DSP Filter Qualify Factor
Dipswitch Settings

Material/Zero Tracking

Tracking provides the ability to reject sensor drift and other related long-term errors while preserving the output's stability and accuracy. Discrimination between material movement and sensor drift is accomplished by calculating the rate of change of the sensor input signal every ten seconds, and comparing this rate to a user-defined threshhold rate. The STX stops tracking when the rate of change exceeds the threshhold rate, indicating that material is actually moving. Additionally, discrimination between slow material loss (such as from a leak in the vessel) or gain and sensor drift is accomplished by comparing the total drift to a drift limit. The STX limits the maximum correction to this limit, so tracking does not mask real material loss/gain. There are two aspects to tracking — zero tracking and material tracking. See Figure 3-5:

- **Zero tracking** establishes a user-defined window around the voltage associated with zero live load. When the raw voltage falls inside the window (usually indicating a negligible amount of material in the vessel) and the rate of change is below the threshhold rate, the corrected voltage and counts remain constant as those associated with zero live load (if serially communicating with an MVS, displayed weight remains zero). The correction is done by the algebraic addition of a correction offset value to the A/D converter output. If the raw voltage falls outside the window on the negative side, the STX resets the zero calibration point to that raw voltage, and sets the window around the new zero calibration point.
- **Material tracking** establishes a reference when material movement within a vessel has become stable (rate of change is below the threshhold) during filling and batching processes. This reference is then used to maintain and hold steady the outputs. When the change in raw voltage falls within the drift limit (factory set at ± 5.00 mV), the corrected voltage and counts remain those associated with the reference weight. The correction is done by the algebraic addition of a correction offset to the A/D converter output. The maximum accumulated correction offset is limited to ± 5.0 mV. If the accumulated drift exceeds 5.0 mV, the STX begins tracking material movement, which may be caused by a slow leak in the vessel.

Both zero and material tracking affect the STX's current output as well as serial output to an MVS or other serial device.

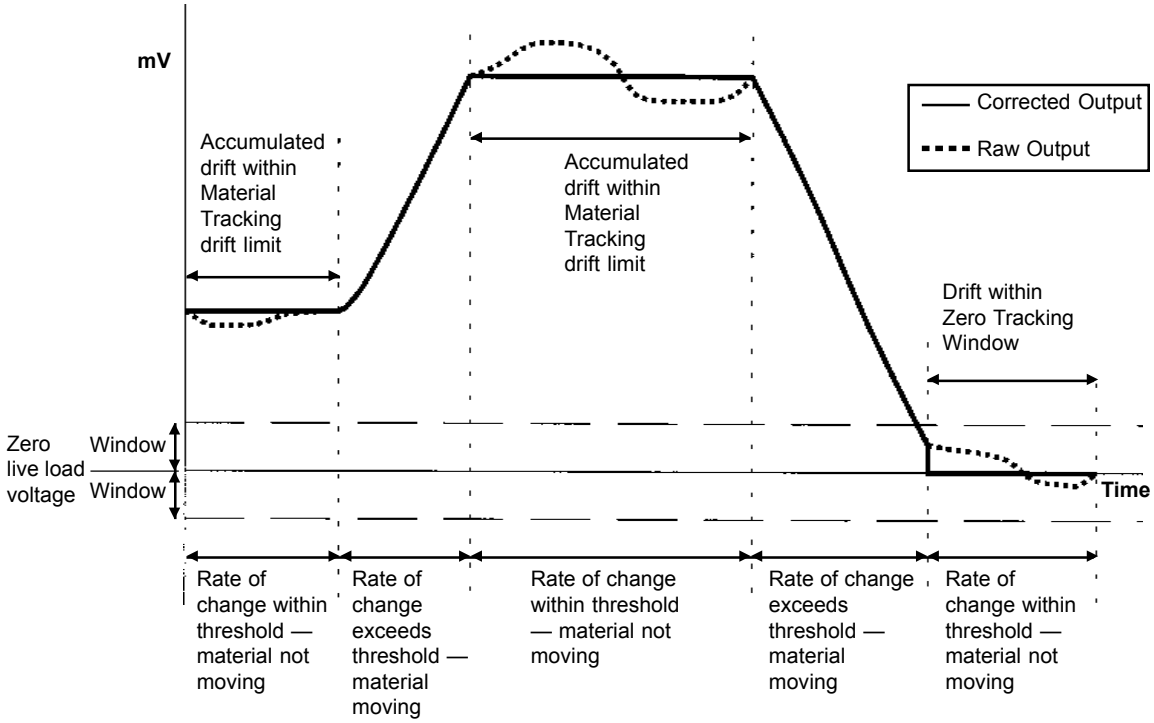


Figure 3-5. Material and Zero Tracking Example

Tracking can be utilized in any of the following combinations:

- No zero or material tracking
- Zero tracking only
- Material tracking only
- Zero tracking and material tracking

The Material/Zero Tracking has three parameters to define its operation:

Zero Tracking Window

This parameter sets the maximum plus or minus offset value for zero tracking. If the minus offset value is exceeded, the STX resets the zero calibration point. The default is .00 mV — at this value, zero tracking is turned off.

Refer to Table 3-16 for the positions of DS1 through DS8 and then follow the procedure in *Setting Up the Parameter*.

DS4	DS3	DS2	DS1	Window (mV)
0	0	0	0	.00 (zero tracking off)*
0	0	0	1	.05
0	0	1	0	.10
0	0	1	1	.15
0	1	0	0	.20
0	1	0	1	.25
0	1	1	0	.50
0	1	1	1	1.00
1	0	0	0	1.25
1	0	0	1	1.50
1	0	1	0	1.75
1	0	1	1	2.00
1	1	0	0	2.50
1	1	0	1	3.00
1	1	1	0	3.50

1 = on, 0 = off, * = default
Note: To select Zero Tracking Window, set dipswitches DS5 through DS8: DS8 = 1, DS7 = 1, DS6 = 0, DS5 = 1.

Table 3-16. Material/Zero Tracking Zero Tracking Window Dipswitch Settings

Tracking Rate

The Tracking Rate sets the threshhold in uV/sec for both zero and material tracking. When the rate of change exceeds this value, indicating that material is actually moving, the STX stops tracking until the rate of change again falls below this value. The default is ± 5.0 uV/sec.

Refer to Table 3-17 for the positions of DS1 through DS8 and then follow the procedure in *Setting Up the Parameter*.

DS4	DS3	DS2	DS1	Tracking Rate (Micro V/s)
0	0	0	0	.30
0	0	0	1	.50
0	0	1	0	.80
0	0	1	1	1.00
0	1	0	0	1.50
0	1	0	1	2.00
0	1	1	0	2.50
0	1	1	1	3.00
1	0	0	0	3.50
1	0	0	1	4.00
1	0	1	0	4.50
1	0	1	1	5.00*
1	1	0	0	10.00
1	1	0	1	20.00
1	1	1	0	50.00
1	1	1	1	150.00

1 = on, 0 = off, * = default
Note: To select Zero Tracking Rate, set dipswitches DS5 through DS8: DS8 = 1, DS7 = 1, DS6 = 1, DS5 = 0.

Table 3-17. Material/Zero Tracking Tracking Rate Dipswitch Settings

Material Tracking On/Off

This parameter turns Material Tracking on and off.

Refer to Table 3-18 for the positions of DS1 through DS8 and then follow the procedure in *Setting Up the Parameter*.

DS4	DS3	DS2	DS1	Material Tracking
0	0	0	0	Off*
0	0	0	1	On

1 = on, 0 = off, * = default
Note: To select Material Tracking On/Off, set dipswitches DS5 through DS8: DS8 = 1, DS7 = 1, DS6 = 1, DS5 = 1.

Table 3-18. Material/Zero Tracking Material Tracking On/Off Dipswitch Settings

Remote Tare

The remote tare feature allows you to tare or ‘zero’ a vessel. Remote tare is useful when you want to monitor how much material is added to or removed from the vessel from a given point. The effect is as follows:

- If the STX current output is in Net Mode, the current output will correspond to the change in weight since the last time the vessel was tared, rather than to the total weight in the vessel.
- (if STX installed in or serially communicating with MVS) If the MVS-STX display is set to Net (by pressing the Net/Gross Key), the display will correspond to the change in weight since the last time the vessel was tared, rather than to the total weight in the vessel. If setpoints and/or current outputs are set up based on net weight, their activation will correspond to the change in weight since the last time the vessel was tared.
- (if STX serially communicating with PC, ROPE, etc.) Any serial communications related to the Net weight will correspond to the change in weight since the last time the vessel was tared.

Refer to the referenced drawings in Appendix H. To activate the remote tare:

- Stand-Alone (TI-SP.STX-02): Short IN and +5V on TB1 on the STX PCB together for 1 second with a dry contact.
- Standard 19” Rack (TI-SP.STX-03) or MVS-STX (TI-MVS.STX-01): Short Digital In and +Vout on TB2 on the Termination PCB together for 1 second with a dry contact.

Chapter 4. MVS-STX Menu Tree, Keyboard Functions, and Quick Start

Introduction

This chapter describes the structure of the MVS-STX menu system and how to use the MVS keyboard to display and modify parameters for:

- a stand-alone STX serially connected to an MVS **or**
- an STX PCB installed in the MVS

Additionally, this chapter provides a list of steps to get a 'Quick Start' using the MVS-STX.

Note

To access the menus, press the Auto/Man Key to turn off the Auto LED. Then, press the Menu Key.

Methods of Operation

The MVS has two methods of operation:

- Channel Monitoring — material weight is displayed. Channel monitoring has two modes:
  - — Auto Mode displays information on each channel sequentially.
  - — Manual Mode displays information on one channel. The Arrow Keys are used to manually scroll to other channels.

  Pressing the Auto/Man Key while channel monitoring switches between the modes.
- Menu Operation — system parameters for display, input/output, calibration, and troubleshooting are viewed and modified. Pressing the Menu Key while in Manual Mode accesses Menu Operation.

Note

Throughout this manual, 'weight' is used to refer to an indication of the quantity of material in the vessel. However, the MVS-STX can be set up to display weight, level, volume, percentage, voltage, etc. (see Chapter 5, MVS-STX Display Menu). If using some measure other than weight, all inputs must be consistent with your chosen measure.

Menu Tree

The MVS-STX menu tree is used to view and modify setup parameters and troubleshoot the system. There are four submenus under the *Main* Menu:

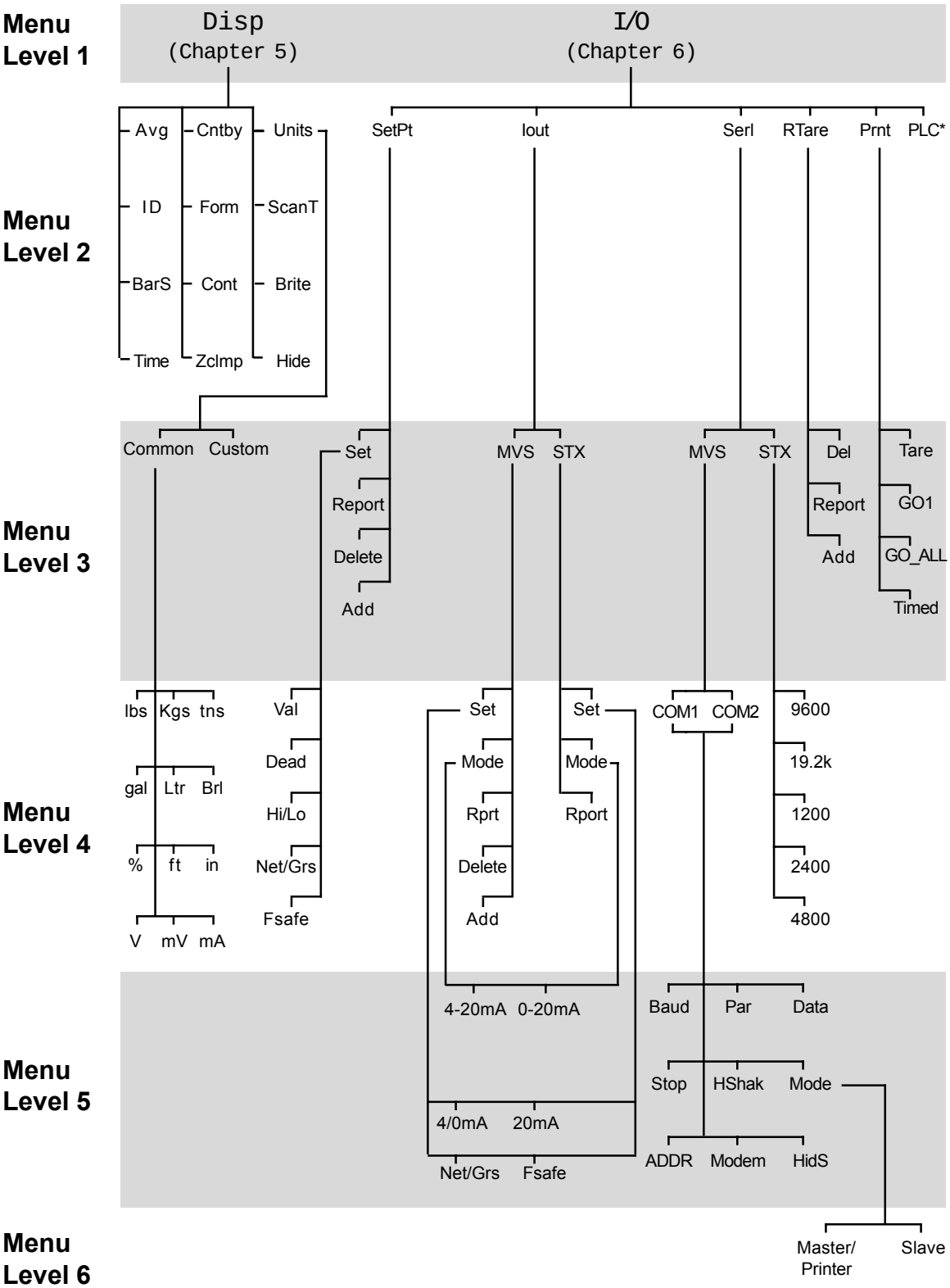
- *Disp* (Chapter 5) — set up display settings
- *I/O* (Chapter 6) — set up setpoint, current output, serial port, remote tare, print, and PLC interface parameters
- *Cal* (Chapter 7) — calibrate system
- *Service* (Chapter 8) — troubleshoot system; display A/D counts; download calibration to a new PCB; default STX; enable/disable channel; adjust excitation, resolution, gain, and active digits; select analog or digital mode; set up filtering and tracking; test setpoints; test and calibrate current outputs; reset ID; test keyboard; print setup information; rescan PCB and slave devices; reset RAM; standardize STX PCB; test serial communications; test RAM; set up user access code and enter K-M Mfg Code

The menu tree in Figure 4-1 is a quick reference guide. The menu tree shows the *Main* Menu in Level 1 and submenus in Levels 2 – 6. For example, if you want to change setpoint parameters, the menu tree shows that setpoints are set up in the *I/O* Menu. Level 2 shows the submenus that display when *I/O* is selected. Level 3 shows the submenus that display when a selection is made from Level 2, etc.

Chapters 5 through 8 provide detailed information on the function and use of the *Disp, I/O, Cal*, and *Service* Menus.

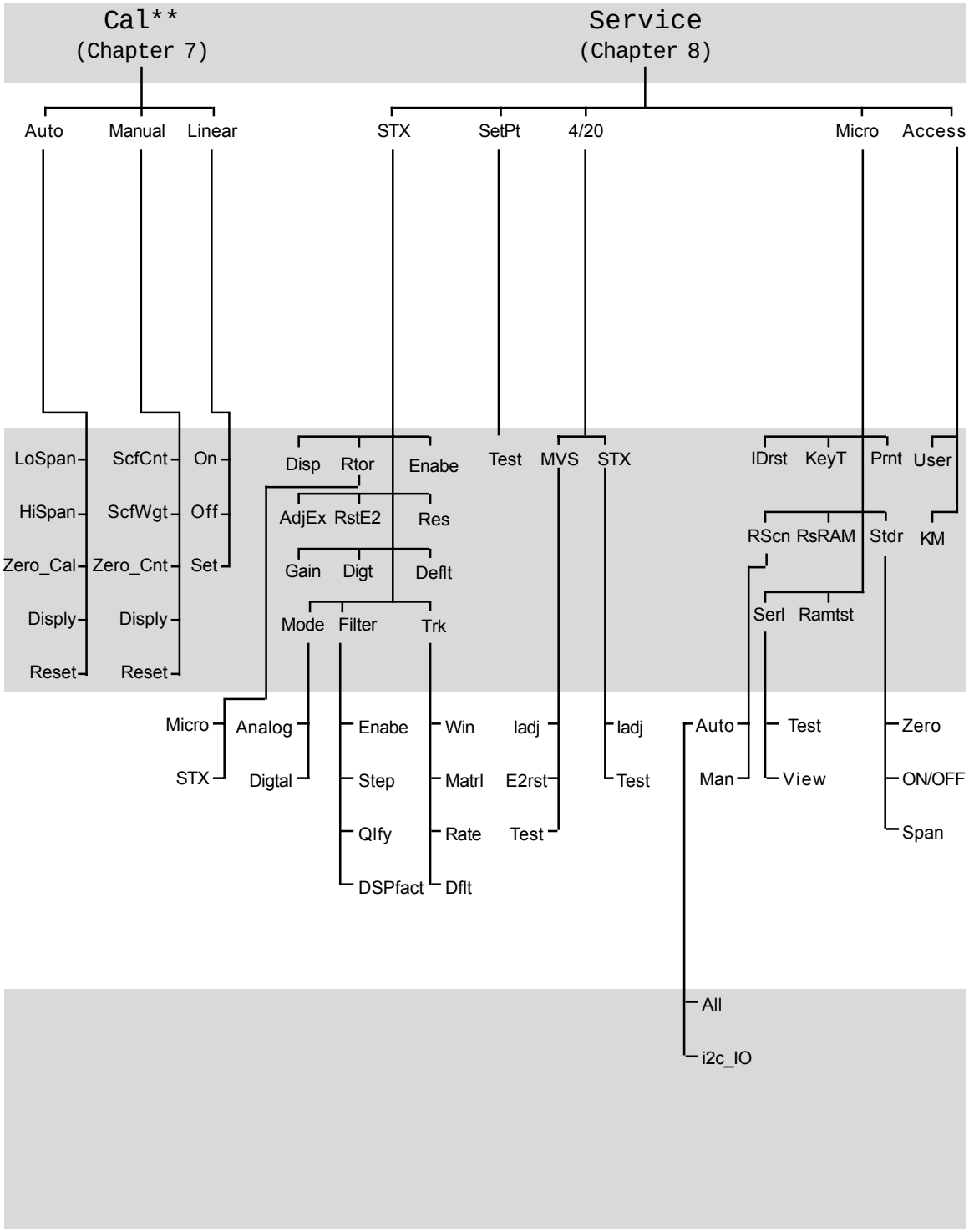
Note

Some submenus are not shown in Figure 4-1 due to space constraints. For example, if you select *Disp* in Level 1 and *ScanT* in Level 2, a menu appears with several values to select from for *ScanT*. For more details on submenus, see the appropriate chapter in this manual.



* Submenus are available for PLC only if the MVS includes an MVS-RIO PCB or MVS-Modbus PCB. See *MVS-RIO Installation and Operation Manual* or *MVS-Modbus Installation and Operation Manual* for detailed information.

Figure 4-1. MVS-STX Menu Tree (continued on next page)



** If in a Math Channel, the *Cal* Menu is replaced by the *Math* Menu. See Chapter 9, MVS-STX Math Channels, for detailed information.

Figure 4-1. MVS-STX Menu Tree (continued from previous page)

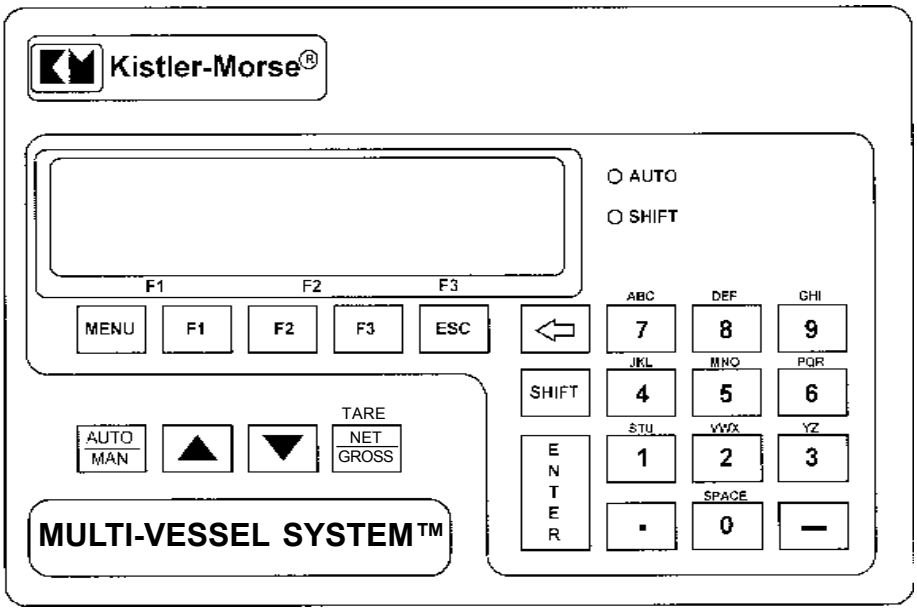


Figure 4-2. MVS Faceplate and Display

Display and Keyboard

See Figure 4-2. The MVS display/keyboard panel has a liquid crystal display (LCD) with two 16-character lines and an integral, weather-sealed membrane keyboard. The LCD displays the vessel ID, material weight numerically or in bar graph format, menu selections, and error messages.

The MVS keyboard is used to access menus, scroll through channel monitoring display screens, and enter setup parameters. Each key's function is described below.

Auto/Man Key

When channel monitoring, the MVS displays the factory-set ID number (or customer-defined ID, if input) and material weight. The MVS can be set up to scroll automatically through the display screen for each channel (Auto Mode) or remain fixed on a selected channel (Manual Mode). Press the Auto/Man Key to toggle between Auto and Manual Modes:

- When in Auto Mode, the display remains on one channel for a preset time before scrolling to the next channel. The preset display time can be changed to suit operator needs (see *ScanT* in Chapter 5, MVS-STX Display Menu). The Auto LED to the right of the LCD is illuminated when in Auto Mode.
- When in Manual Mode, the display remains fixed on a selected channel and must be scrolled manually with the Arrow Keys to display another channel. The Auto LED is off when in Manual Mode.

The Auto/Man Key is also used to exit any function in the menu tree and return to channel monitoring in Manual Mode.

Up Arrow and Down Arrow Keys

Press an Arrow Key to manually scroll the display through the channels when the MVS is channel monitoring in Manual Mode.

These keys are also used to scroll to a desired parameter value. For example, when setting *LoSpan* in the *Main/Cal/Auto* Menu, press an Arrow Key to scroll to the desired value.

Tare/Net/Gross Key and Shift Key

The Tare/Net/Gross Key is used when channel monitoring in Manual Mode (Auto LED off).

The Shift LED is located below the Auto LED on the faceplate. Press the Shift Key to toggle the Shift LED on and off. The effect is described below:

- Shift LED illuminated — Tare Key is enabled. Press the Tare Key for 1 second to 'tare' the channel on the display, setting the net weight to zero. The tare function is useful when you want to monitor how much material is added to or removed from the vessel from a given point.
- Shift LED not illuminated — Net/Gross Key is enabled. Press this key to toggle the display between net weight (weight added or removed from the vessel since the last tare) and gross weight (total weight of material in vessel).

Note

The STX can also be tared through the STX's remote tare function or through the MVS's remote tare function. See Chapter 3, Stand-Alone STX Analog Calibration and Setup, and Chapter 6, MVS-STX Inputs and Outputs Menu.

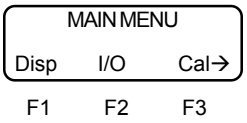
Menu Key

Note

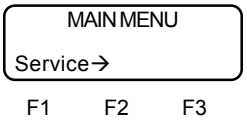
The MVS must be channel monitoring in Manual Mode (Auto LED off) to access the menus.

Press the Menu Key to access the *Main* Menu. If there are multiple pages to a menu, press the Menu Key again to scroll the display to the next page.

For example, the *Main* Menu has two pages. The first page shows:



The → signifies there are additional page(s) to the menu. Press the Menu Key again to display the second page:



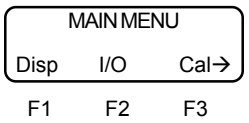
Notice the second page also has a →, indicating there are additional page(s) (in this case, you already viewed the other page). Press the Menu Key again to return to the first page.

The Menu Key has the same scrolling function when accessing a submenu. Press the Menu Key to scroll through the submenu pages. Press the Esc Key to back through the submenus one level at a time and return to the channel monitoring display.

F1, F2, and F3 Keys

The Function Keys — F1, F2, and F3 — are used to select items on the menus. The faceplate has F1, F2, and F3 labeled underneath the LCD. When a menu is displayed, the menu items are located above these labels. Press the Function Key corresponding to the desired menu to access the menu.

For example, when the *Main* Menu is displayed, the selections are:



Disp is above the F1 label, *I/O* is above the F2 label, and *Cal* is above the F3 label. Press the F3 Key to access the submenus under *Cal*.

Esc (escape) Key

The Esc Key has several functions:

- The Esc Key backs through submenus one menu level at a time. Press this key while in the *Main* Menu to return to channel monitoring in Manual Mode.
- The MVS arrives from K-M with a factory-set ID assigned to each channel. If you replaced the ID with a customer-defined ID in the *Disp* Menu, press the Esc Key while channel monitoring in Manual Mode (Auto LED off) to briefly display the factory-set ID.

⇦ (backspace arrow) Key

Press the ⇦Key to back up the cursor on the display when using the Alphanumeric Keys.

"." (period) Key

When the MVS is channel monitoring in Manual Mode, press the "." Key to briefly display the current MVS software revision letter and the date of the release.

The "." Key also functions as a decimal point when entering numbers in the math channel.

Alphanumeric Keys and Shift Key

The Alphanumeric Keys (also called the keypad) are used to type in parameters and customer-defined IDs.

The Shift LED is located below the Auto LED on the faceplate. Press the Shift Key to toggle the Shift LED on and off. The effect is described below:

- Shift LED not illuminated — Press an Alphanumeric Key to type the number shown on the key.
- Shift LED illuminated — Press an Alphanumeric Key to type a letter labeled above the key. Press the key repeatedly to toggle through the three letters labeled above the key. When the desired letter is displayed, press the Enter Key or a different Alphanumeric Key to advance the cursor one space to the right. Table 4-1 shows the characters available for a customer-defined ID.

Key	Character Shift LED On	Character Shift LED Off
1	S T U	1
2	V W X	2
3	Y Z	3
4	J K L	4
5	M N O	5
6	P Q R	6
7	A B C	7
8	D E F	8
9	G H I	9
0	Space	0
.	.	:
-	-	-
Menu	+ * / @ % # & |	a b c d e f g h

Note: Additional characters (parentheses and symbols) are available using the F1, F2, and F3 Keys; Auto/Man Key; Arrow Keys; and Tare/Net/Gross Key.

Table 4-1. Customer-Defined ID Characters

Enter Key

The Enter Key has several functions:

- The Enter Key saves in memory any parameter set up in the menu tree. For example, after typing a value in the *Main/Cal/LoSpan* Menu, press the Enter Key to save it. The value remains in memory until a new value is entered.
- When typing in a vessel ID, press the Enter Key to advance the cursor one space to the right.
- When displaying gross weight in Manual Mode, press the Enter Key to toggle from numerical to bar graph format. The display remains in bar graph format (even when the MVS is turned off and back on again) until the Enter Key is pressed to toggle back to numerical format.

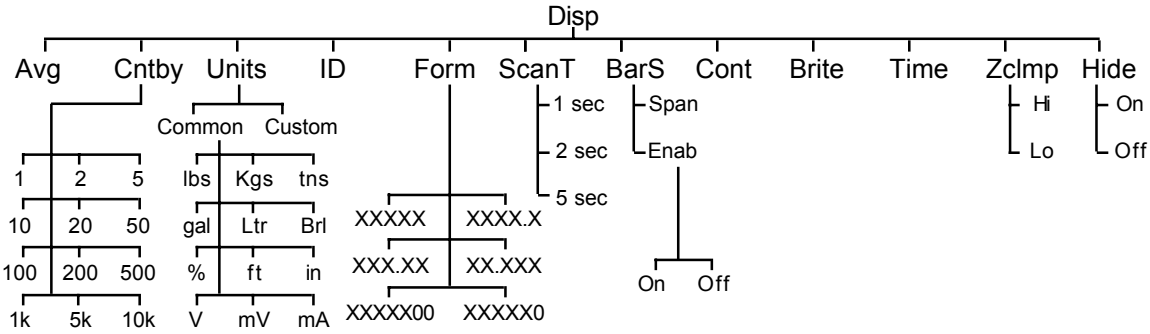
Quick Start

This section provides a list of the steps to get a 'Quick Start' using the MVS:

1. If the MVS is connected to slave (external) signal processors, perform the *RScn* (rescan) procedure. This enables the MVS to recognize the external processors. Read the *RScn* section in Chapter 8, MVS-STX Service Menu. Follow the procedure provided.
2. Read the *Avg*, *Cntby*, *Units*, and *Form* sections in Chapter 5, MVS-STX Display Menu. Follow the procedures provided for each channel.
3. Calibrate the system for each channel, using one of the following methods:
   - If you can move at least 25% of the vessel's maximum live load as part of the calibration procedure, read the *Auto* section in Chapter 7, MVS-STX Calibration Menu. Follow the procedure provided.
   - If you cannot move at least 25% of the vessel's maximum live load as part of the calibration procedure, read the *Manual* section in Chapter 7, MVS-STX Calibration Menu. Follow the procedure provided.
4. Adjust the excitation and gain if you are using the STX with full-bridge sensors. Read the *AdjEx* and *Gain* sections in Chapter 8, MVS-STX Service Menu.

That's it — you can begin to use the MVS to monitor the contents of your vessel(s). However, it is recommended that you read Chapters 5 through 9 for a thorough understanding of the operation of the MVS-STX and the available options. The manual explains in detail how to set up setpoints, current outputs, and serial communications.

Chapter 5. MVS-STX Display Menu



Avg: set number of readings to average
Cntby: set display countby increment
Units: set display units
ID: input customer-defined identification
Form: set display format
ScanT: set time display remains on one channel before scrolling to next
BarS: set up bar graph
Cont: control contrast
Brite: control brightness
Time: set time and date
Zclmp: set window around zero gross weight
Hide: hide channel from display scanning sequence

Figure 5-1. Display Menu Tree

Introduction

The *Disp* (display) Menu is used to set up parameters that govern display functions when channel monitoring. This chapter provides explanations of the display parameters. Additionally, detailed navigation procedures through the menu tree are provided for a few of the functions.

Unless otherwise noted, each channel's display functions (such as units, ID, etc.) can be set differently.

As shown in Figure 5-1, the *Disp* Menu has twelve submenus.

Avg (average)

This menu sets the number of readings (from 1 to 255) the MVS averages for each displayed weight while channel monitoring. The MVS calculates a running average. The larger the number of readings in the average, the smaller effect a variation in signal has on the average. This results in fewer display variations and an easier to read display. *Avg* affects the value seen on the display as well as setpoints, current outputs, and serial outputs. The default for *Avg* is 1.

Follow this procedure to modify *Avg*:

1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:

   MAIN MENU
   Disp I/O Cal→
   F1 F2 F3

4. Press the F1 Key to access the *Disp* Menu. The display shows:

   DISPLAY MENU
   Avg Cntby Units→
   F1 F2 F3

5. Press the F1 Key to access the *Avg* Menu. The display looks like this:

   AVERAGE FACTOR
   > 1
   F1 F2 F3

6. Use the keypad or Arrow Keys to input the desired value. Press the Enter Key. The display acknowledges the entry and returns to:

   DISPLAY MENU
   Avg Cntby Units→
   F1 F2 F3

7. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

Cntby (countby)

This menu set the display to count by increments of 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000, 5000, or 10000. A *Cntby* of 1 causes the rightmost active digit to change by increments of 1. A *Cntby* of 100 causes the rightmost three active digits to change by increments of 100. Use *Cntby* to adjust the display to a resolution consistent with system accuracy and reduce display flickering.

Note that the selection for *Form* affects how the MVS interprets *Cntby*. Table 5-1 shows examples of how these are related.

Form	*Cntby*	**Example Value** (incremented digit underlined)
xxx.xx	1	397.25
xxx.xx	100	397.00
xxxxx	1	39725
xxxxx	100	39700
xxxxxoo	1	3972500
xxxxxoo	100	3970000

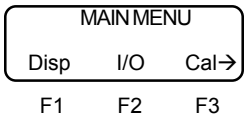
Table 5-1. Interaction of Form and Cntby

Example: For a 10,000 lb maximum weight with *Form* of XXXXX, a *Cntby* of 1 is meaningful only if system accuracy is ±.01% of maximum load. A more typical accuracy for a bolt-on strain gage application might be ±1%. Since 1% of 10,000 lbs is 100 lbs, a more realistic *Cntby* for this system is 100.

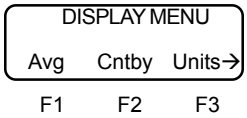
The default for *Cntby* is 1. *Cntby* only affects the value on the display. Setpoints, current outputs, and serial outputs are unaffected by *Cntby*.

Follow this procedure to modify *Cntby*:

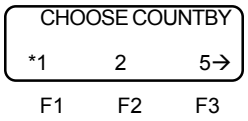
1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



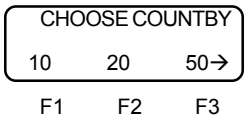
4. Press the F1 Key to access the *Disp* Menu. The display shows:



5. Press the F2 Key to access the *Cntby* Menu. The display shows:

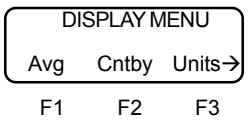


(Asterisk indicates the current selection.) If the displayed menu does not have the desired countby, press the Menu Key to display the menu's second page. The display shows:



Continue to press the Menu Key until you see the desired countby (menu has four pages).

6. Press the F1, F2, or F3 Key to select the desired countby. The display acknowledges the selection and returns to:



7. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

Units

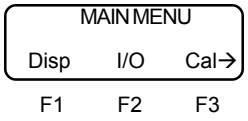
This menu sets the display unit of measure. Listed below are the units available in the *Common* submenu:

lbs (pounds)	*Kgs* (kilograms)
tns (tons)	*gal* (gallons)
Ltr (liters)	*Brl* (barrels)
% (percent)	*ft* (feet)
in (inches)	*V* (volts)
mV (millivolts)	*mA* (milliamps)

In the *Custom* submenu, you can type in a custom three-character unit of measure. The default unit is *XXX*.

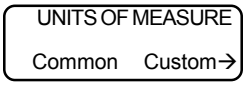
Follow this procedure to select a *Common* unit:

1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:

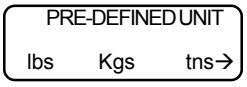


4. Press the F1 Key to access the *Disp* Menu. The display shows:

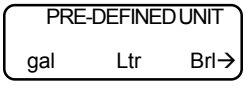
5. Press the F3 Key to access the *Units* Menu. The display shows:



6. Press the F1 Key to access the *Common* Menu. The display shows:



   If the displayed menu does not have the desired unit, press the Menu Key to display the menu's second page. The display shows:



   Continue to press the Menu Key until you see the desired unit (menu has four pages).
7. Press the F1, F2, or F3 Key to select the desired unit. The display acknowledges the selection and returns to:

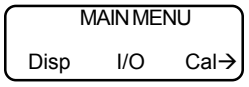
8. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

ID (identification)

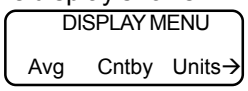
The MVS comes with a factory-set ID number assigned to each channel. The *ID* Menu allows you to input a 16-character alphanumeric title to identify each channel in a meaningful manner. After the ID is input, you can view the original factory-set ID when channel monitoring in Manual Mode by pressing the Esc Key.

Follow this procedure to input an ID:

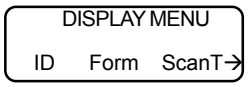
1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



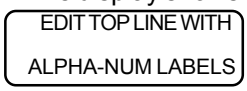
4. Press the F1 Key to access the *Disp* Menu. The display shows:



5. Press the Menu Key to display the menu's second page. The display shows:



6. Press the F1 Key to provide a customer-defined ID. The display shows:

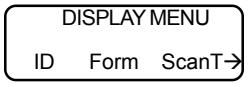


   The top line of the display then changes to the factory-set ID and the Shift LED automatically comes on.
7. Type in the first alphanumeric of the ID. Press the Enter Key *or* press the next alphanumeric in the ID (if it is on a different key than the previous one) to accept the displayed alphanumeric. The cursor advances one space to the right.

Notes

1. Type in a letter, using an Alphanumeric Key. Press the key repeatedly to toggle through the three letters listed above the key until the desired letter is displayed.
2. To include a number(s) in the ID, press the Shift Key; the Shift LED turns off. Press the desired Alphanumeric Key.
3. Use the ⇦ Key to back up the cursor to correct an entry.

8. Repeat Step 7 until the display shows the entire customer-defined ID.
9. Press the Esc Key to enter the ID in memory. The display returns to:



10. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

Form (format)

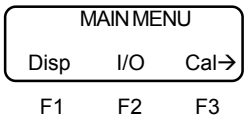
This menu sets the number of digits to be displayed to the left and right of the decimal point while channel monitoring. Listed below are the six formats available (x is a place holder and 0 is a 'dummy' zero):

xxxxx (default)	xxxx.x	xxx.xx
xx.xxx	xxxxxoo	xxxxxo

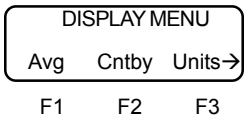
Form is used with *Cntby* and *Avg* to provide a stable display and meaningful results consistent with system accuracy. For example, the display should not show a weight of 100.01 lbs if system accuracy is ±2 lbs.

Follow this procedure to modify *Form*:

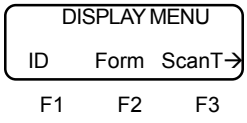
1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



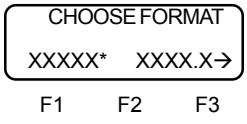
4. Press the F1 Key to access the *Disp* Menu. The display shows:



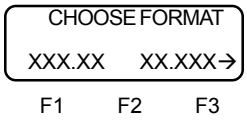
5. Press the Menu Key to access the menu's second page. The display shows:



6. Press the F2 Key to access the *Form* Menu. The display shows:

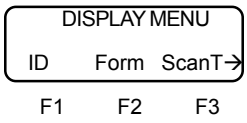


(Asterisk indicates the current selection.) If the displayed menu does not have the desired form, press the Menu Key to display the menu's second page. The display shows:



Continue to press the Menu Key until you see the desired form (menu has three pages).

7. Press the F1, F2, or F3 Key to select the desired form. The display acknowledges the selection and returns to:



8. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

ScanT (scan time)

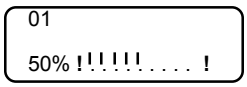
This menu sets the amount of time the MVS displays channel monitoring information before scrolling to the next channel when in Auto Mode. Scan time can be set to 1, 2, or 5 seconds. The default is 2 seconds. The current selection is indicated by an asterisk.

ScanT is set in the menu tree for *any* channel, and applies to *all* channels in the system.

BarS (bar graph)

You can view the gross weight numerically or as a bar graph while channel monitoring. The graph's maximum span (*Span*) and selection of the graph as the display option (*Enab*) areS set with this menu.

The bar graph displays the weight as a numerical percentage to the left of the graph, as shown below:



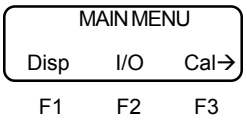
The graph's 0% point is always 0. The 100% point is set with *Span*. For example, entering the vessel's maximum capacity of 5000 lbs as *Span* results in a graph with 0% corresponding to 0 lbs and 100% corresponding to 5000 lbs. If the gross weight falls outside the range, the graph responds as follows:

- Gross weight below 0 (caused by inaccuracy in calibration, vibration, sensor drift, etc.) — Graph remains at 0% and numerical percentage remains at 0%.
- Gross weight above *Span* — Graph remains at 100% and numerical percentage reflects actual weight. For example, if *Span* is 5000 lbs and gross weight is 7500 lbs, the numerical percentage is 150% while the graph remains at 100%.

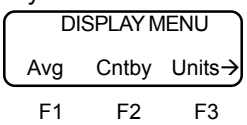
The default for *Span* is 9999. The default for *Enab* is *Off* (graph not displayed). If enabled, the graph displays in both Manual and Auto Modes. While viewing the gross weight in Manual Mode, pressing the Enter Key toggles between bar graph and numerical display, regardless of whether the graph is enabled.

Follow this procedure to set *Span* and *Enab*:

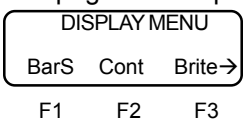
1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



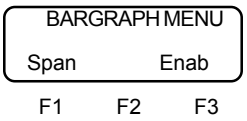
4. Press the F1 Key to access the *Disp* Menu. The display shows:



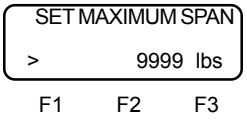
5. Press the Menu Key twice to display the menu's third page. The display shows:



6. Press the F1 Key to access *BarS*. The display shows:

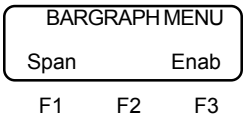


7. Press the F1 Key to set the *Span*. The display looks like this:

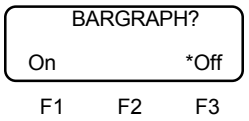


(Units are consistent with *Units* Menu.)

8. Use the keypad or Arrow Keys to enter the desired value. Press the Enter Key. The display acknowledges the entry and returns to:

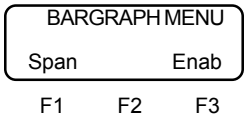


9. Press the F3 Key to access *Enab*. The display shows:



(Asterisk indicates the current selection.)

10. Press the F1 Key to enable or the F3 Key to disable the graph. The display acknowledges the selection and returns to:



11. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

Cont (contrast)

Display contrast is adjusted in this menu. The contrast ranges from 0 (darkest) to 255 (lightest). The default is 128. Use the Arrow Keys to make fine adjustments, or the F2 and F3 Keys to make coarse adjustments. The contrast changes immediately as you make the adjustment. When the desired results are attained, press the Enter Key to save the new value.

Cont is set in the menu tree for *any* channel and applies to *all* channels in the system.

Brite

Display brightness is adjusted in this menu (menu is functional only with purchase of Backlight option). The brightness ranges from 0 (darkest) to 255 (lightest). The default is 128. Use the Arrow Keys to make fine adjustments, or the F2 and F3 Keys to make coarse adjustments. The brightness changes immediately as you make the adjustment. When the desired results are attained, press the Enter Key to save the new value.

Brite is set in the menu tree for *any* channel and applies to *all* channels in the system.

Time

Time and date are set in this menu. Accuracy is better than ±1 minute per month, and timekeeping is maintained for more than 10 years without power. Time/date are included on printed output, so setting them can help you maintain good documentation.

In the *Time* Menu, the characters directly to the right of the flashing cursor are modified with the Arrow Keys. Press the Enter Key to advance the cursor to the next field. Press the Esc Key to enter the values in memory.

Time is set in the menu tree for *any* channel and applies to *all* channels in the system.

Zclmp (zero clamp)

This menu sets a window around zero for the gross weight. When the gross weight falls within the specified range (usually indicating a negligible amount of material in the vessel), the display is forced to zero.

The user can specify a different range for gross weight above zero (*Hi*) and below zero (*Lo*). For example, with a *Lo* of -200 and *Hi* of 100, all gross weights between -200 and +100 appear as 0 on the display. If *Lo* is 0, the display may show a small negative gross weight when the vessel is near empty if the calibration is not completely accurate. *Zclmp* only affects the value on the display. Setpoints, current outputs, and serial outputs are unaffected.

Hi can range from 0 to 255; *Lo* can range from 0 to -255. The default for both is 0. The values can be modified using the Arrow Keys or by direct entry with the keypad. When the desired number is shown, pressing the Enter Key saves the new value.

When inputting *Hi* and *Lo*, the display automatically shows fixed zeroes or decimal point, consistent with *Form*. Table 4-2 provides examples of the maximum values.

Form	Maximum Value for *Hi and Lo*
xxx.xx	2.55
xxxxx	255
xxxxxoo	25500

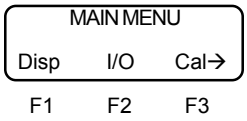
Table 5-2. Interaction of Form and Zclmp

Hide

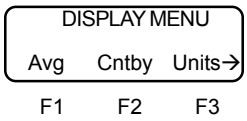
This menu allows you to 'hide' a channel from the MVS's scanning sequence. The MVS continues to monitor the hidden channel but does not display it. This function is useful if you are not using all available channels to monitor vessels, want to observe specific channels without taking other channels off-line, or want to hide a math channel that contains intermediate results. The default for *Hide* is *Off* (i.e., the channel is not hidden).

Follow this procedure to hide channels:

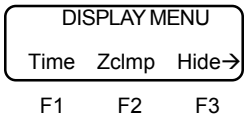
1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



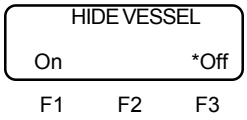
4. Press the F1 Key to access the *Disp* Menu. The display shows:



5. Press the Menu Key three times to access the menu's fourth page. The display shows:

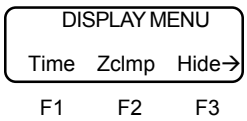


6. Press the F3 Key to access the *Hide* Menu. The display shows:



(Asterisk indicates the current selection.)

7. Press the F1 Key to hide the channel. The display acknowledges the selection and returns to:

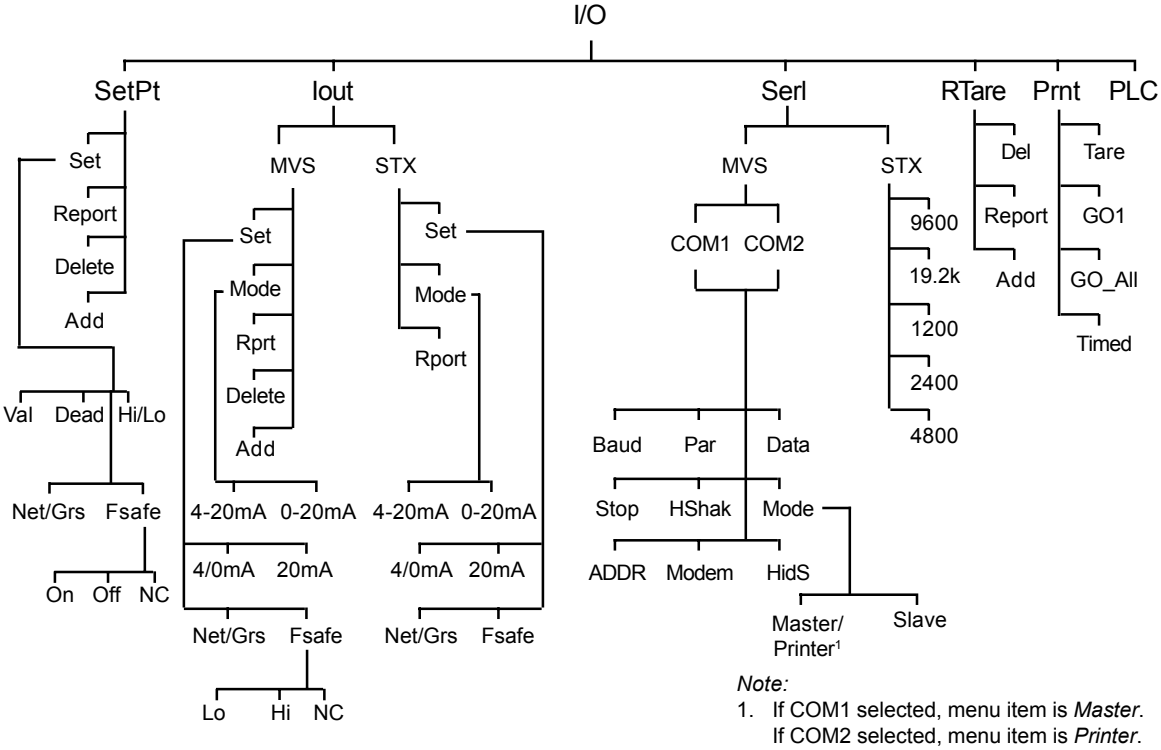


Note

The MVS will not hide a channel until you enable *Hide*, described in Step 8.

8. Press the Auto/Man Key to return to channel monitoring in Manual Mode. Press the Shift Key (Shift LED illuminated) and then press the '9' Key. The MVS acknowledges *Hide* is enabled. All channels that have *On* selected in the *Hide* Menu will not display until you disable *Hide* (see Step 9).
9. To display hidden channels again, while channel monitoring in Manual Mode press the Shift Key (Shift LED illuminated) and then press the '9' Key. The MVS acknowledges *Hide* is disabled, and the display will show all channels again.

Chapter 6. MVS-STX Inputs and Outputs Menu



SetPt: establish parameters for setpoint relays on a Relay Output PCB in the MVS
Iout: establish parameters for current output through a Current Output PCB in the MVS and/or through the current output channel on the STX PCB
Serl: establish parameters for serial communications between the MVS and external equipment and/or between the STX PCB and external equipment
RTare: set up remote tare input on Remote Tare Input PCB in the MVS
Prnt: direct output to a printer
PLC: establish parameters for communications with a PLC

Figure 6-1. Input/Output Menu Tree

Introduction

The *I/O* Menu is used to enter parameters for setpoints, current output (4-20 mA, 0-20 mA), serial port configuration, remote tare operation, printer functions, and PLC interface. This chapter provides descriptions of the *I/O* parameters. Additionally, detailed navigation procedures through the menu tree are provided for the setpoint and current output functions.

As shown in Figure 6-1, the *I/O* Menu has six submenus:

- *SetPt* — set up setpoints to activate or deactivate a relay on a Relay Output PCB in the MVS
- *Iout* — set up current outputs on the STX and/or a Current Output PCB in the MVS
- *Serl* — set up serial communications settings for use with a PC, printer, etc.
- *RTare* — set up remote tare input on a Remote Tare PCB in the MVS
- *Prnt* — direct output to a printer
- *PLC* — set up communications with a PLC

SetPt (setpoint relays)

The setpoint value is the weight measurement where you wish a device (for example, a pump) to activate or deactivate. The setpoint setup functions for each channel are accessed in this menu. They include adding and deleting setpoints and selecting activation levels, high or low activation, deadband values, fail-safe parameters, and net or gross weight activation.

Setpoints are available with an optional Relay Output PCB(s) in the MVS. The capacity of each Relay Output PCB is 8 setpoints. The total number of setpoints in the system is limited only by the number of Relay Output PCBs in the MVS. Up to eight setpoints can be assigned per vessel or math channel.

The *Descriptions* section defines each of the parameters. The *Setting Up Setpoints* and *Setpoint Report* sections provide the procedures for using the MVS.

Descriptions

Set

This menu is used to select and set up the setpoint for the displayed channel. Up to eight setpoints, labeled SP1 for setpoint 1 through SP8 for setpoint 8, can be assigned for the channel. *Set* has five submenus:

- *Val* — *Val* establishes the energizing value, the point where the setpoint relay changes state. The '-' Key toggles between positive and negative for the value entered, if you designated energizing based on net weight (*Net*). The default is 0.
- *Dead* — The deadband (*Dead*) determines the point at which a setpoint relay returns to its normal on/off state **after** the relay has been energized. *Dead* equals the amount of material that will be added to or removed from the vessel before the setpoint relay is de-energized. K-M recommends the use of a non-zero *Dead* to prevent relays from oscillating. The default is 2, with decimal point/dummy zeroes consistent with *Form*.
- *Hi/Lo* — Setpoint relays can be configured to change state either above (*Hi*) or below (*Lo*) the setpoint value. The default is *Lo*.
- *Net/Grs* — Setpoint relays can be set to energize based on tracking net weight or gross weight (*Net/Grs*). Energizing based on gross weight is the default.
- *Fsafe* — If the MVS detects a problem, one of three fail-safe (*Fsafe*) conditions can be applied to a setpoint:
  — *On*
  — *Off* — default
  — *NC* (no change)
  On energizes the setpoint in a fail-safe condition. *Off* de-energizes the setpoint in a fail-safe condition. *NC* makes no change to the setpoint in a fail-safe condition (i.e., if it was energized before the problem was detected it will continue to be energized).
  A fail-safe condition remains in effect until the problem has been corrected. Following are examples of fail-safe conditions:
  — Analog-to-digital converter overrange/underrange condition
  — Engineering units overrange
  — Communication error with an STX PCB or a serial device

Example: See Figure 6-2. A vessel with a 9,300 lb capacity has setpoint 1 (*SP1*) set at 9,000 lbs gross weight (*Net/Grs* is set to *Grs*). *Hi/Lo* is set to *Hi* and *Dead* is set at 1,000 lbs. When the contents exceed 9,000 lbs, the setpoint energizes, activating a pump to remove material from the vessel. The pump continues to operate until the setpoint de-energizes at a material weight of 8,000 lbs (9,000 lbs minus the 1,000 lb deadband).

This vessel has setpoint 2 (*SP2*) set at 2,000 lbs gross weight (*Net/Grs* is set to *Grs*). *Hi/Lo* is set to *Lo* and *Dead* is set at 500 lbs. When the contents falls below 2,000 lbs, the setpoint energizes, activating a pump to fill the vessel. The pump continues to operate until the setpoint de-energizes at a material weight of 2,500 lbs (2,000 lbs plus the 500 lb deadband).

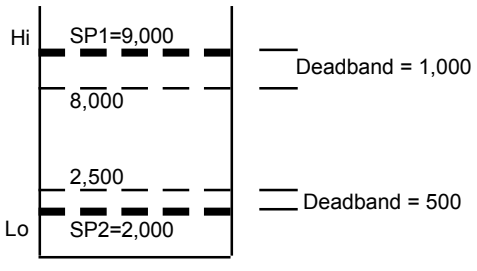
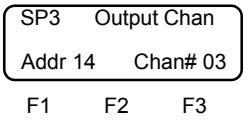


Figure 6-2. Setpoint Example

Report

When this menu is accessed, the display shows all setpoints assigned to the current channel. A typical display looks like this:



- *SP3* is the setpoint label
- *Addr 14* is the Relay Output PCB's hexadecimal address
- *Chan# 03* is the setpoint's channel number on the Relay Output PCB

Pressing any key other than the Esc or Auto/Man Key cycles through the reports for all other assigned setpoints for this channel.

Delete

This menu allows previously added setpoints to be removed from the current channel. The display top line shows an assigned setpoint number. The bottom line shows the Relay Output PCB's hexadecimal address and the setpoint's channel number on the Relay Output PCB.

To delete a setpoint, cycle through the setpoints by pressing any key other than Esc, Auto/Man, or Enter until the setpoint you want to delete is displayed. Then, press the Enter Key. To prevent accidental deletion, the display requests verification. If the response is *Yes* then *I/O Channel Deleted* displays to confirm the deletion. This setpoint channel is now available for use again.

Add

This menu is used to add setpoints (up to eight) for the current channel. **Note that the setpoint must be added before the *Set* parameters (*Val*, *Dead*, etc.) can be input.** The display bottom line shows the Relay Output PCB's hexadecimal address and the setpoint's channel number on the Relay Output PCB. Pressing the Arrow Keys cycles through all other unassigned setpoint channels. Pressing the Enter Key adds the setpoint.

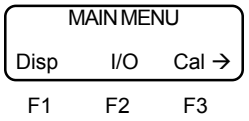
Setting Up Setpoints

Note

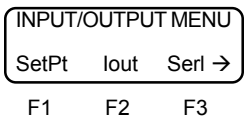
For older versions of this product, the K-M Mfg Code must be entered to gain access to the *Add* and *Delete* Menus. These menus do not appear unless the K-M Mfg Code has been entered.

Follow this procedure to add and set up setpoints:

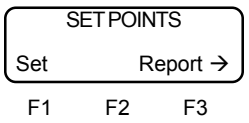
1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



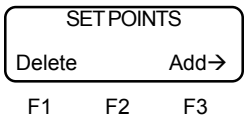
4. Press the F2 Key to access the *I/O* Menu. The display shows:



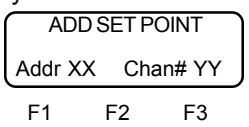
5. Press the F1 Key to access the *SetPt* Menu. The display shows:



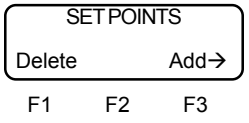
6. Press the Menu Key to display the menu's second page. The display shows:



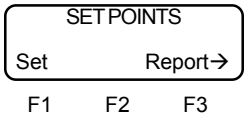
7. Press the F3 Key to add a setpoint. The MVS displays the Relay Output PCB's hexadecimal address and the next available setpoint channel number. The display looks like this:



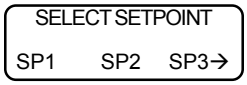
   Press the Arrow Keys to cycle through the unassigned setpoint channels until the one you want is displayed. Press the Enter Key to accept. The display acknowledges the selection and returns to:



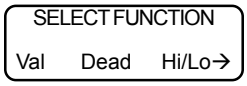
8. Repeat Step 7 as desired to add up to eight setpoints, and then press the Menu Key to return to the first page of the *Setpoints* Menu. The display shows:



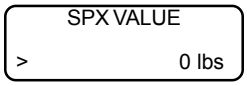
9. Press the F1 Key to select *Set* and set up a setpoint. The display looks similar to this (depending on the number of setpoints you added for this channel):



10. Press the F1, F2, or F3 Key to select the desired setpoint. The display shows:

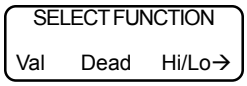


11. Press the F1 Key to select *Val*. The display looks like this:

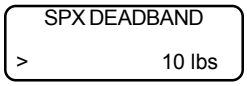


(Units are consistent with *Units* Menu.)

12. Use the keypad or Arrow Keys to input the value where you want the setpoint to energize. Press the Enter Key. The display acknowledges the entry and returns to:

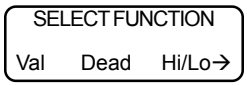


13. Press the F2 Key to select *Dead,* to set up a deadband for the setpoint. The display looks like this:

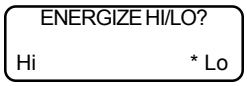


(Units are consistent with *Units* Menu.)

14. Use the keypad or Arrow Keys to input the deadband. Press the Enter Key. The display acknowledges the entry and returns to:

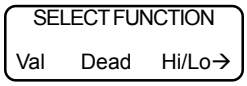


15. The setpoint relays can be configured to change state either above (*Hi*) or below (*Lo*) the setpoint value. Press the F3 Key to select *Hi/Lo*. The display shows:

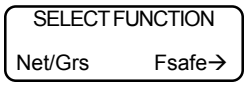


(Asterisk indicates the current selection.)

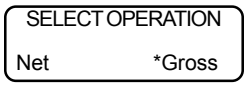
16. Press the F1 Key to select *Hi* or F3 Key to select *Lo*. The display acknowledges the selection and returns to:



17. Press the Menu Key to access the menu's second page. The display shows:

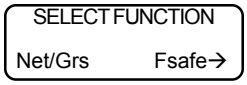


18. Press the F1 Key to access *Net/Grs*. The display shows:

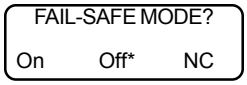


(Asterisk indicates the current selection.)

19. Press the F1 Key to select *Net* or F3 Key to select *Grs*. The display acknowledges the selection and returns to:

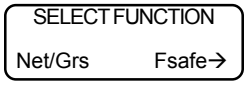


20. Press the F3 Key to select *Fsafe*. The display shows:

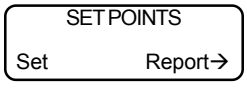


(Asterisk indicates the current selection.)

21. Press the F1, F2, or F3 Key to select the desired fail-safe condition. The display acknowledges the selection and returns to:



22. Press the Esc Key. The display returns to:

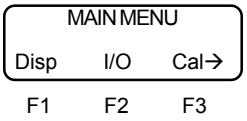


23. Repeat Steps 9 through 22 to set up additional setpoints if desired.
24. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

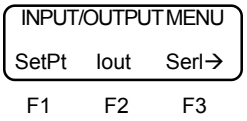
Setpoint Report

The MVS allows you to view the address and channel number of the setpoints of any channel in the system. Follow this procedure:

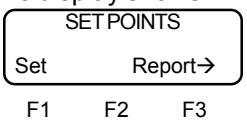
1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



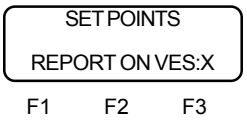
4. Press the F2 Key to access the *I/O* Menu. The display shows:



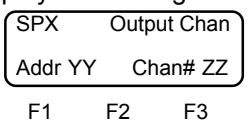
5. Press the F1 Key to access the *SetPt* Menu. The display shows:



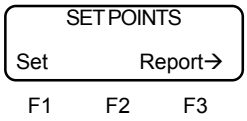
6. Press the F3 Key to access the *Report* Menu. The display flashes a message stating:



The display then changes to:



7. Press any key other than Esc or Auto/Man Key to toggle through the setpoints.
8. Press the Esc Key to return to:



9. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

Iout (current output)

Current output is typically used to retransmit continuous weight data to a remote display or PLC/Distributed Control System (DCS). The current output setup functions are accessed in this menu. The functions include adding and deleting current outputs, and selecting fail-safe, net/gross, and operating modes.

One current output can be assigned to an STX channel through the current output capability on the STX PCB. Additionally, up to two current outputs can be assigned to an STX channel through an optional Current Output PCB in the MVS. The capacity of each Current Output PCB is 8 current outputs. The total number of current outputs in the system is limited only by the number of Current Output PCBs in the MVS.

The *Descriptions* section defines each of the parameters. The *Setting Up Current Outputs on the Current Output PCB, Setting Up Current Output on the STX PCB,* and *Current Output Report* sections provide the procedures for using the MVS.

Descriptions

Selection of *MVS* or *STX* in the *Iout* Menu determines the PCB for which the current output is set up:

- *MVS* — current output is set up on one of the two available current output channels on a Current Output PCB in the MVS.
- *STX* — current output is set up on the one current output channel on the STX PCB.

Once *MVS* or *STX* is selected the setup is similar. However, the *Add* and *Delete* menus do not appear when setting up current output on the STX PCB.

Set

This menu is used to select current outputs, assign values to determine the points where the transmitter outputs the currents, designate those values as net or gross weights, and define a fail-safe condition for the current outputs. Set has four submenus:

- *4/0ma* and *20ma* — The *4/0ma* Menu sets the low current (4 mA or 0 mA) operation point; the value entered determines the weight where the transmitter outputs the minimum current. The *20ma* Menu sets the high current (20 mA) operation point; the value entered determines the weight where the transmitter outputs the maximum current. For both *4/0ma* and *20ma* Menus, the '-' Key toggles between positive and negative for the value entered, if you designated activation based on net weight (*Net*).

Note

The value entered for the 4/0 mA operation point can be smaller than **or** larger than the value entered for the 20 mA operation point.

- *Net/Grs* — Current outputs may be set to interpret the value entered for the low current and high current operation points as either the net or gross weight *(Net/Grs)*. Transmitting current based on gross weight is the default.
- *Fsafe* — If the MVS detects a problem, one of three fail-safe *(Fsafe)* conditions can be applied to a current output:
  — *Lo* — default for Current Output PCB
  — *Hi*
  — *NC* (no change) — default for STX PCB

  Lo forces the current output to be 0 (in 0-20 mA operating mode) or 4 mA (in 4-20 mA operating mode) in a fail-safe condition. *Hi* forces the output to be 20 mA in a fail-safe condition. *NC* makes no change to the current output in a fail-safe condition (i.e., what was being transmitted before the problem was detected will continue to be transmitted). A fail-safe condition remains in effect until the problem has been corrected. Following are examples of fail-safe conditions:
  — Analog-to-digital converter overrange/underrange condition
  — Engineering units overrange
  — Communication error with the STX PCB or with a serial device

Example 1: You want an early warning via a current output to a PLC/DCS that a 20,000 lb capacity vessel is nearly full or empty. You enter 3,000 lbs as the low current value and 17,000 lbs as the high current value, both as gross values, for a 4-20 mA operation. When the gross weight is 3,000 lbs, 4 mA current is transmitted, providing an early warning that the vessel is close to being empty. When the gross weight is 17,000 lbs, 20 mA is transmitted, providing an early warning that the vessel is close to being full.

Example 2: You want to monitor how much material is added to or removed from a vessel, and transmit a current output to a remote display. You enter -5,000 lbs as the low current value and 7,000 lbs as the high current value, both as net values, for a 0-20 mA operation. When the net weight is -5,000 lbs (5,000 lbs has been removed since you last tared the channel), 0 mA current is transmitted. When the net weight is +7,000 lbs (7,000 lbs has been added since you last tared the channel), 20 mA current is transmitted.

Mode

The current transmitter can be set up to output 0-20 mA or 4-20 mA. This menu is used to select one of the two operating modes. The default is 4-20 mA.

Rprt (report)

When this menu is accessed, the display shows the current outputs assigned to the displayed channel. The display varies, depending on whether the current output is on the Current Output PCB (in the *MVS* Menu) or on the STX PCB (in the *STX* Menu):

- *MVS* — The display top line shows an assigned current output number. The bottom line shows the Current Output PCB's hexadecimal address and the current output's channel number on the Current Output PCB. Pressing any key other than Esc or Auto/Man toggles between the assigned current output channels.
- *STX* — The display top line indicates the current output is on the STX PCB. The bottom line shows the channel ID and the STX PCB's hexadecimal address.

Delete (MVS only; does not apply to current output on STX PCB)

This menu allows previously added current outputs to be removed from the displayed channel. The display top line shows an assigned current output number. The bottom line shows the Current Output PCB's hexadecimal address and the current output's channel number on the Current Output PCB.

To delete a current output, cycle through the current outputs for the channel by pressing any key other than Esc, Auto/Man, or Enter until the current output you want to delete is displayed. Then, press the Enter Key. To prevent accidental deletion, the display requests verification. If the response is *Yes* then *I/O Channel Deleted* displays to confirm the channel deletion. This current output channel is now available for use again.

Add (MVS only; does not apply to current output on STX PCB)

This menu is used to add current outputs (up to two) for the current channel. **Note that the current output channel must be added before the *Set* parameters (4/0 mA, 20 mA, etc.) can be input**. The bottom line of the display shows the Current Output PCB's hexadecimal address and the current output's channel number on the Current Output PCB. Pressing the Arrow Keys cycles through all other unassigned current output channels. Pressing the Enter Key adds the current output channel.

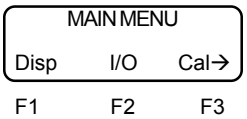
Setting Up Current Outputs on the Current Output PCB

Note

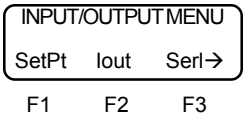
For older versions of this product, the K-M Mfg Code must be entered to gain access to the *Add* and *Delete* Menus. These menus do not appear unless the K-M Mfg Code has been entered.

Follow this procedure to set up current outputs on the Current Output PCB in the MVS. To set up current output on the STX PCB, refer to *Setting Up Current Output on the STX PCB* below.

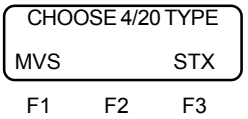
1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel .
3. Press the Menu Key to display the *Main* Menu. The display shows:



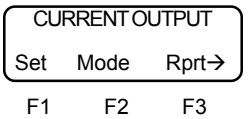
4. Press the F2 Key to access the *I/O* Menu. The display shows:



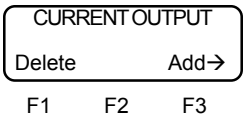
5. Press the F2 Key to access the *Iout* Menu. The display shows:



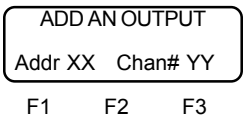
6. Press the F1 Key to select *MVS*. The display shows:



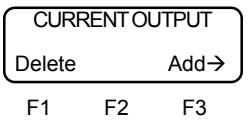
7. Press the Menu Key to display the menu's second page. The display shows:



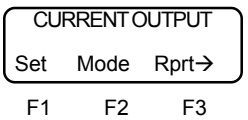
8. Press the F3 Key to add a current output. The MVS displays the Current Output PCB's hexadecimal address and the next available channel number. The display looks like this:



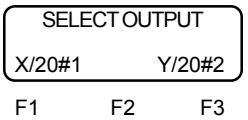
Press the Arrow Keys to cycle through the unassigned channels. Press the Enter Key to accept. The display acknowledges the selection and returns to:



9. Repeat Step 8 as desired to add up to two current outputs, and then press the Menu Key to return to the first page of the *Current Output* Menu. The display shows:

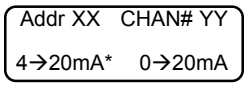


10. Press the F2 Key to access the *Mode* Menu. If you added only one output, go to Step 11. If you added two outputs the display looks like this:



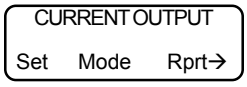
A '4' or '0' will be in place of the 'X' and 'Y.' Press the F1 Key to set the mode for output #1 or the F3 Key to set the mode for output #2.

11. The display looks like this:

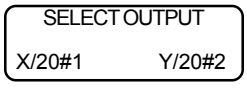


(Asterisk indicates the current selection.)

12. Press the F1 Key for the current output range to be 4 to 20 mA or the F3 Key for 0 to 20 mA. The display acknowledges the selection and returns to:

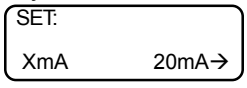


13. Press the F1 Key to access the *Set* Menu. If you added one output, proceed to Step 14. If you added two outputs, the display looks like this:



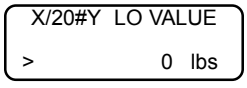
A '4' or '0' will be in place of the 'X' and 'Y.' Press the F1 Key to set up output #1 or the F3 Key to set up output #2.

14. The display looks like this:



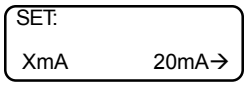
A '4' or a '0' will be in place of the 'X.'

15. Press the F1 Key to access *4/0mA*. The display looks like this:

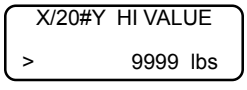


A '4' or a '0' will be in place of the 'X.' (Units are consistent with *Units* Menu.)

16. Use the keypad or Arrow Keys to input a value for the weight where you want the current transmitter to output 4 mA (0 mA if applicable). Press the Enter Key. The display acknowledges the entry and returns to:

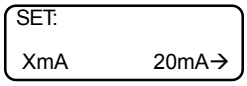


17. Press the F3 Key to access *20mA*. The display looks like this:

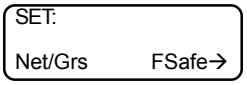


A '4' or a '0' will be in place of the 'X.' (Units are consistent with *Units* Menu.)

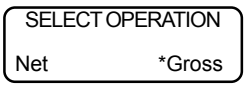
18. Use the keypad or Arrow Keys to input a value for the weight where you want the current transmitter to output 20 mA. Press the Enter Key. The display acknowledges the entry and returns to:



19. Press the Menu Key to access the menu's second page. The display shows:



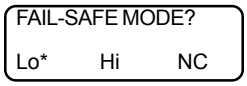
20. Press the F1 Key to access *Net/Grs*. The display shows:



(Asterisk indicates the current selection.)

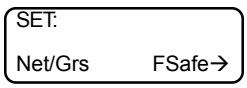
21. Press the F1 Key to select *Net* or the F3 Key to select *Gross*. The display acknowledges the selection and returns to:

22. Press the F3 Key to select *Fsafe*. The display shows:



(Asterisk indicates the current selection.)

23. Press the F1, F2, or F3 Key to select the desired fail-safe condition. The display acknowledges the selection and returns to:

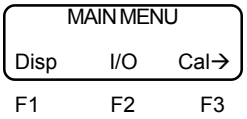


24. Press the Esc Key to return to the *Current Output* Menu and repeat Steps 10 through 23 to set up additional outputs if desired.
25. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

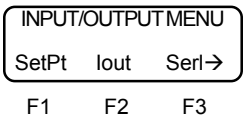
Setting Up Current Output on the STX PCB

Follow this procedure to set up the current output on the STX PCB. To set up the current output on the Current Output PCB in the MVS, refer to *Setting Up Current Outputs on the Current Output PCB* above.

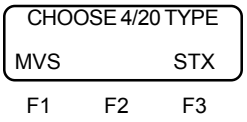
1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel .
3. Press the Menu Key to display the *Main* Menu. The display shows:



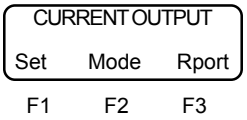
4. Press the F2 Key to access the *I/O* Menu. The display shows:



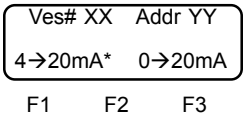
5. Press the F2 Key to access the *Iout* Menu. The display shows:



6. Press the F3 Key to select *STX*. The display shows:

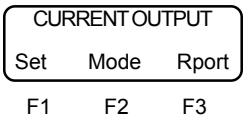


7. Press the F2 Key to access the *Mode* Menu. The display looks like this:

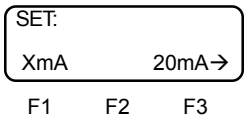


(Asterisk indicates the current selection.)

8. Press the F1 Key for the current output range to be 4 to 20 mA or the F3 Key for 0 to 20 mA. The display acknowledges the selection and returns to:

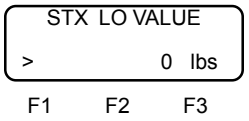


9. Press the F1 Key to access the *Set* Menu. The display looks like this:



A '4' or a '0' will be in place of the 'X.'

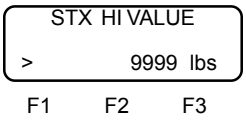
10. Press the F1 Key to access *4/0mA*. The display looks like this:



(Units are consistent with *Units* Menu.)

11. Use the keypad or Arrow Keys to input a value for the weight where you want the current transmitter to output 4 mA (0 mA if applicable). Press the Enter Key. The display acknowledges the entry and returns to:

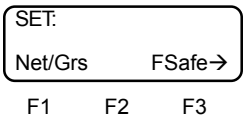
12. Press the F3 Key to access *20mA*. The display looks like this:



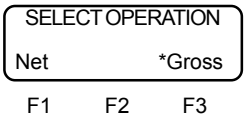
(Units are consistent with *Units* Menu.)

13. Use the keypad or Arrow Keys to input a value for the weight where you want the current transmitter to output 20 mA. Press the Enter Key. The display acknowledges the entry and returns to:

14. Press the Menu Key to access the menu's second page. The display shows:

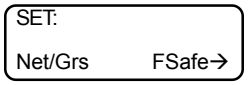


15. Press the F1 Key to access *Net/Grs*. The display shows:

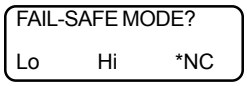


(Asterisk indicates the current selection.)

16. Press the F1 Key to select *Net* or F3 Key to select *Gross*. The display acknowledges the selection and returns to:

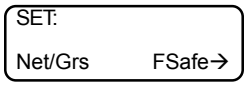


17. Press the F3 Key to select *Fsafe*. The display shows:



(Asterisk indicates the current selection.)

18. Press the F1, F2, or F3 Key to select the desired fail-safe condition. The display acknowledges the selection and returns to:

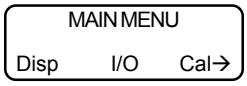


19. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

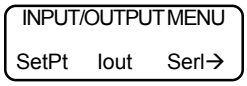
Current Output Report

The MVS allows you to view the address and channel number of the current outputs of any channel in the system. Follow this procedure to access the report for the current outputs on the Current Output PCB; the procedure to access the report for the STX PCB's current output is similar.

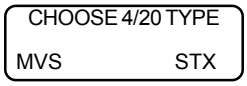
1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



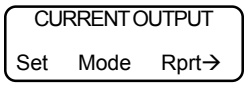
4. Press the F2 Key to access the *I/O* Menu. The display shows:



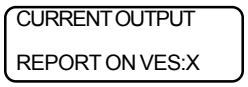
5. Press the F2 Key to access the *Iout* Menu. The display shows:



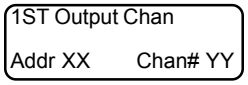
6. Press the F1 Key to select *MVS*. The display shows:



7. Press the F3 Key to access the *Rprt* Menu. The display flashes a message stating:

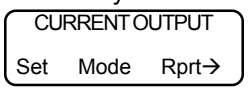


The channel number you previously scrolled to will be displayed after VES. The display then changes to:



Use the Arrow Keys to cycle between the current outputs on the Current Output PCB.

8. Press the Esc Key to return to:



9. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

Serl (serial data)

The *Serl* Menu sets up serial communications between the MVS or the STX PCB and external equipment, such as:

- a PLC with a BASIC Module or a similar communication device
- a K-M ROPE system

The *Serl* Menu also sets up communications between the MVS and other signal processors, such as a stand-alone STX.

Serl has two submenus: *MVS* and *STX*. The *MVS* submenu sets up serial communications between the MVS and external equipment; serial communications can include information relating to **all** MVS channels, including the STX channel. The *STX* submenu sets up serial communications between the STX PCB, which has its own COM port, and external equipment; serial communications include information relating only to the one STX channel on the STX PCB.

MVS

The MVS has two COM ports — COM1 and COM2. Both ports can be hardware configured to operate with the following standard communication interfaces: RS-232, RS-422, and RS-485. Refer to the *Multi-Vessel System Installation and Operation Manual* for information on how to serially connect the MVS to various external equipment.

The MVS's adjustable serial communications settings can be modified by the user, as described below under those menu items. When connecting the MVS to external equipment, all serial communications settings must match for the equipment to communicate. As necessary, modify the MVS's default settings to match the settings on the external equipment.

Each COM port can have different serial communications settings. *MVS* has nine submenus to configure each COM port (refer to Figure 6-1). Within each submenu (except *ADDR*), the current selection is indicated on the MVS display with an asterisk. The submenus are described below.

Baud

The baud rate (bits per second) is set up in the *Baud* Menu. The baud rate determines the speed with which the MVS communicates with the PLC, printer, etc. There are six baud rates available:

- *300*
- *1200*
- *2400*
- *4800*
- *9600* (default)
- *19200*

Par (parity)

The serial port parity is set up in the *Par* Menu. There are three parity choices:

- *None* (default)
- *Even*
- *Odd*

Data (data bits)

The number of data bits that make up a transmitted character is set up in the *Data* Menu. There are two choices:

- *Seven*
- *Eight* (default)

Stop (stop bits)

The number of stop bits used to end a character field is set up in the *Stop* Menu. There are two choices:

- *One* (default)
- *Two*

HShak (handshaking)

Handshaking is turned on or off in the *HShak* Menu. Handshaking is necessary when a large amount of data is transmitted and the receiving device, such as a printer, cannot process the data quickly enough. With handshaking, the receiving device can force the 'Clear to Send' (CTS) handshake control line low. This causes the MVS to pause until the device is ready to receive more data. There are two choices for handshaking:

- *Yes*
- *No* (default)

Mode

The serial port mode of operation is set up in the *Mode* Menu. The menu choices for *Mode* for COM1 and COM2 are different, as shown below:

COM1	COM2
Master	*Printer*
Slave (default)	*Slave* (default)

For both COM1 and COM2, when *Slave* is selected the MVS cannot initiate serial communications. It can only respond to serial commands from a master device, such as a PC running a K-M ROPE system or another MVS configured as a master.

For COM1, when *Master* is selected the MVS can initiate serial communications with slave serial devices, such as other K-M signal processors or other manufacturers' signal processors that support serial communications. Only one master device can exist on a serial line at one time, so if *Master* is selected for the MVS all other devices on the serial line must be configured as slaves. Note that COM1 cannot be used to connect a printer to the MVS.

For COM2, when *Printer* is selected the MVS can send data to a printer. Only COM2 supports printer functions.

ADDR (address)

External equipment may have many signal processors daisy chain wired to it. The signal processor base address identifies the signal processor and associated channels to the external equipment. Each device on the same serial connection must have a different base address. The base address of the MVS's COM port is set up in the *ADDR* Menu. The base address can be expressed in two ways — decimal form (ranging from 0 to 255) and hexadecimal form (ranging from 0 to FF). The default is 01 in decimal form (01 in hexadecimal form).

When *ADDR* is selected, a typical display looks like this:

```
ENTER BASE ADDRS
> 01 Dec=   01 Hex
F1      F2      F3
```

The display lower line shows two number fields. The first number is the base address in decimal form. The second number is the hexadecimal equivalent. The keypad is used to input a number directly, or the Arrow Keys can be used to scroll to a number. Only the decimal form of the address can be altered by the user; the hexadecimal form changes automatically to correspond to the decimal form. Pressing the Enter Key saves the new value in memory.

Each channel in the MVS has a unique serial address, based on the base address of the COM port through which it is being addressed and the factory-set channel ID number. The serial address of any channel is calculated with the formula:

Channel Serial Address (hexadecimal form) =
COM Port Base Address
(hexadecimal form) + Channel ID# - 1

Modem

If an RF modem is used on COM1, a longer serial communications time-out may be necessary to keep COM errors from occurring. There are two choices for *Modem*:

- *Yes*
- *No* (default)

Selecting *Yes* in the *Modem* Menu lengthens the communications time-out.

HidS (serial hide)

HidS disables or enables channels from serial communications. This allows you to provide only the desired information through the serial port, such as sending math channel data without vessel monitoring channel data. There are two choices for *HidS*:

- *Yes* — disables channel from serial communication
- *No* (default) — enables channel for serial communication

Note

To establish serial communications between the MVS and a stand-alone STX, set the MVS's *COM1* to *Master* and set the baud rate, data bits, stop, and parity to match those for the STX, described below.

STX

The STX PCB has one COM port. It can be hardware configured to operate with the following standard communication interfaces: RS-232, RS-422, and RS-485. Refer to Appendix H, Technical Drawings, for information on how to serially connect the STX PCB to various external equipment. Refer to Table 2-1 in Chapter 2, Hardware Installation, for the dipswitch settings to configure the serial port on the STX PCB.

The STX can only be the slave to external equipment. The STX's built-in serial communications settings are 8 data bits, 1 stop, no parity. These values are fixed, and cannot be modified by the user. The baud rate can be modified by the user. There are five baud rates available:

- *1200*
- *2400*
- *4800*
- *9600* (default)
- *19200*

When connecting the STX to external equipment, all serial communications settings must match for the equipment to communicate. As necessary, modify the default setting for baud rate of the STX. Modify the data bits, stop, and parity settings in the external equipment to match the STX's built-in settings.

RTare (remote tare)

The *RTare* Menu is used to set up a remote tare capability, when the optional Remote Tare PCB is installed in the MVS. This allows you to tare or 'zero' a channel. The Remote Tare PCB is available in two versions: AC or DC. Each Remote Tare PCB contains eight individual input channels. One Remote Tare PCB channel can be assigned per vessel channel. The input channel is activated by applying AC or DC voltage, as applicable, causing the associated vessel channel to tare and setting the net weight to zero. The tare function is useful when you want to monitor how much material is added or removed from the vessel from a given point.

RTare has three submenus, described below.

Note

For older versions of this product, the MVS requests that you enter the K-M Mfg Code to gain access to the *Add* and *Del* Menus.

Add

This menu is used to assign a remote tare channel for the current vessel channel. The remote tare channel must be assigned to a vessel channel before the MVS will recognize the remote tare activation. The display bottom line shows the Remote Tare PCB's hexadecimal address and the remote tare channel number on the PCB. Pressing the Arrow Keys cycles through all other unassigned remote tare channels. Pressing the Enter Key assigns the remote tare channel to the vessel channel.

Del (delete)

This menu is used to delete a remote tare channel for the current vessel channel. The display bottom line shows the Remote Tare PCB's hexadecimal address and the remote tare channel number on the PCB. To delete a remote tare channel press the Enter Key. To prevent accidental deletion, the display requests verification. If the response is *Yes* then *Remote Tare Deleted* displays to confirm the channel deletion. This remote tare channel is now available for use with another vessel channel.

Report

When this menu is accessed, the display shows the remote tare channel assigned to the current vessel channel. The display bottom line shows the Remote Tare PCB's hexadecimal address and the remote tare channel number on the PCB.

Prnt (print)

The *Prnt* Menu is used to direct output data to a printer through COM2 in the MVS. The printout shows the factory-set ID, customer-defined ID, gross weight, net weight, time, and date. *Prnt* has four sub-menus, described below.

Tare

This menu sets up the MVS to print the gross and net weight for the selected channel every time the user tares the channel. Any type of tare — use of the Tare/Net/Gross Key on the keyboard, serial tare, or remote tare — results in the printout of data. The default is *No* (does not print upon tare operation).

GO1

This menu allows the user to print the gross and net weight for the selected channel. After you select *GO1*, the MVS flashes *Printing is in Progress.*

GO_All

This menu allows the user to print the gross and net weight for *all* enabled channels. After you select *GO_All*, the MVS flashes *Printing is in Progress.*

Timed

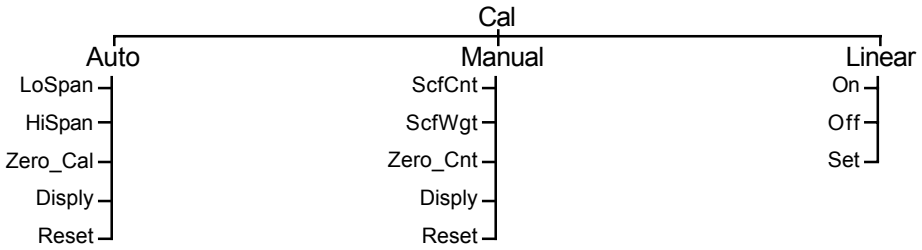
This menu sets up the MVS to print the gross and net weight for *all* enabled channels at designated increments of time. The time increment can range from 0 to 65,535 seconds (18.2 hours). The time is entered using the keypad or Arrow Keys. Pressing the Enter Key saves the new value to memory. The default for *Timed* is 0, which turns the function off.

PLC

The MVS can provide direct serial communications to several types of PLCs:

- Allen-Bradley PLC through the MVS-RIO PCB — Refer to the *MVS-RIO Installation and Operation Manual* for wiring and programming details.
- Modbus PLC through the MVS-Modbus PCB — Refer to the *MVS-Modbus Installation and Operation Manual* for wiring and programming details.
- Siemens PLC — Refer to the *Siemen's Interface User's Manual* for wiring and programming details.

Chapter 7. MVS-STX Calibration Menu



Auto: set lo span, hi span, and zero calibration values while moving material
Manual: manually set scale factor counts, scale factor weight, and zero counts
Linear: set up and enable linearization table

Figure 7-1. Calibration Menu Tree

Introduction

The *Cal* Menu is used to set up and calibrate the STX's 'digital engine' with the sensors (for example, L-Cells, Microcells, Load Stand IIs, Load Disc IIs, or Load Links).

- When the STX is in Digital Mode the MVS display and outputs (setpoints, all current outputs, and serial communications) are based on this digital calibration.
- When the STX is in Analog Mode the current output transmitted by the STX PCB is based on the analog calibration, which is detailed in Chapter 3, Stand-Alone STX Analog Calibration and Setup. However, the MVS display and the other outputs (setpoints, current outputs from the MVS's Current Output PCB, and serial communications) are still based on the digital calibration described in this chapter.

This chapter provides explanations of each of the digital calibration parameters and detailed navigation procedures through the menu tree for each type of digital calibration.

As shown in Figure 7-1, the *Cal* Menu has three submenus, described below:

- *Auto* — sets lo span, hi span, and zero calibration values while moving material into or out of the vessel. **Auto calibration will result in the highest system accuracy.**
- *Manual* — manually sets scale factor counts, scale factor weight, and zero counts. Use manual calibration to pre-calibrate the system, fine-tune the calibration, or re-enter previous calibration data.
- *Linear* — sets up and turns on and off the linearization table. Use this function if the vessel's structure responds non-linearly, but consistently, to changes in load, resulting in consistent, incorrect weight readings after the system has been correctly calibrated.

Auto

There are three methods for performing automatic calibration:

- High-Accuracy Calibration
- Calibration by Adding a Known Quantity of Material
- Calibration by Subtracting a Known Quantity of Material

Each method requires moving a known quantity of material, representing 25% of the vessel's total capacity, into or out of the vessel. The latter two methods do not provide as high accuracy calibration as the first method. However, these lower accuracy calibrations can be later refined to increase the accuracy (see the topic *Refining the Calibration by Setting Zero* in this section).

Note

See Appendix D, MVS-STX Error Messages, for an explanation of error messages you may encounter while performing an Auto Calibration.

High-Accuracy Calibration

This procedure provides the highest accuracy, but requires that the vessel be completely empty to start. The principle behind the calibration follows.

The vessel is completely emptied, and the Lo Span weight is set to zero [point (1) in Figure 7-2]. A known quantity of material, representing at least 25% of the vessel's total capacity, is then added to the vessel. That quantity is entered as the Hi Span weight [point (2) in Figure 7-2]. The MVS saves in memory the Lo Span and Hi Span weights as well as the digital counts associated with each weight. These values define the straight line shown in Figure 7-2. The slope of the line is called the Scale Factor, which is calculated internally.

The accuracy of the calibration improves the greater the known quantity of material added during the calibration procedure. For example, adding 50% of the vessel's total capacity results in greater accuracy than adding 25% of the total capacity.

Follow this procedure to perform a high-accuracy calibration:

1. Completely empty the vessel.
2. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
3. Use the Arrow Keys to scroll to the desired channel.
4. Press the Menu Key to display the *Main* Menu. The display shows:

```
MAIN MENU
Disp      I/O     Cal →
F1        F2      F3
```

5. Press the F3 Key to access the *Cal* Menu. The display shows:

```
CALIBRATION MENU
Auto              Manual→
F1        F2      F3
```

6. Press the F1 Key to access the *Auto* Menu. The display shows:

```
AUTO CAL MENU
LoSpan            HiSpan→
F1        F2      F3
```

7. Press the F1 Key to access *LoSpan*. The display looks like this:

```
LO SPAN AUTO CAL
>                 0  lbs
F1        F2      F3
```

(Units are consistent with *Units* Menu.)

8. Use the keypad or Arrow Keys to input zero as the *LoSpan*. Press the Enter Key. The display acknowledges the entry and returns to:

```
AUTO CAL MENU
LoSpan            HiSpan→
F1        F2      F3
```

Note

If the filling process takes a long time **and** you need to use the MVS to monitor vessel contents during filling, enter *ScfCnt*, *ScfWgt*, and then *Zero_Cal* now. (If you do not, disregard channel monitoring data until you complete the *Auto* Calibration in Steps 9 through 11.) Complete the *Auto* calibration as described below.

9. Add a known quantity of material, representing at least 25% of the vessel's total capacity, to the vessel.

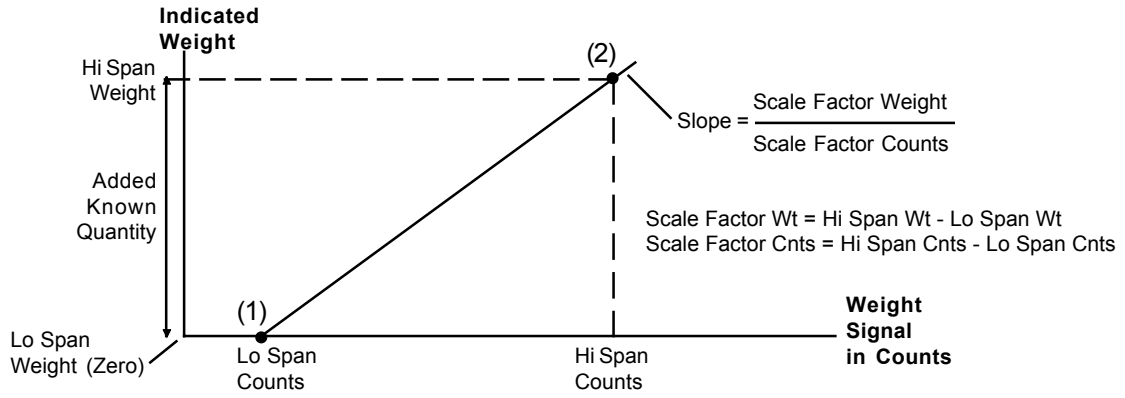


Figure 7-2. High-Accuracy Calibration

10. Press the F3 Key to access *HiSpan*. The display looks like this:

```
HI SPAN AUTO CAL
>            9999  lbs
F1      F2     F3
```

(Units are consistent with *Units* Menu.)

11. Use the keypad or Arrow Keys to input a value that represents the quantity of material added to the vessel. Press the Enter Key. The display acknowledges the entry and returns to:

```
AUTO CAL MENU
LoSpan      HiSpan→
F1      F2     F3
```

12. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

Calibration by Adding a Known Quantity of Material

This calibration method does not require the vessel to be empty. The principle behind the calibration follows.

A weight estimated to be the quantity of material in the vessel is entered as the Lo Span weight [point (1) in Figure 7-3]. A known quantity of material, representing at least 25% of the vessel's total capacity, is added to the vessel. The sum of the known quantity plus the estimated quantity is entered as the Hi Span weight [point (2) in Figure 7-3]. The MVS saves in memory the Lo Span and Hi Span weights as well as the digital counts associated with each weight. These values define the dashed straight line and the calculated zero counts shown in Figure 7-3. The slope of the line is called the Scale Factor, which is calculated internally.

The slope of the line is reasonably accurate, because it is calculated based on the known difference between the Lo Span and Hi Span weights and counts. However, if the estimated Lo Span weight is incorrect, the actual 'location' of the line is incorrect, resulting in errors in channel monitoring. The greater the error in the estimated Lo Span, the greater the resulting error. The 'location' of the line can be adjusted to the solid line by setting zero [point (3) in Figure 7-3] (see *Refining the Calibration by Setting Zero* in this section).

The greater the known quantity of material added during the calibration procedure, the greater the accuracy of the calibration. Adding 50% of the total capacity results in greater accuracy than adding 25% of the total capacity.

Follow this procedure to calibrate by adding a known quantity of material:

1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel.

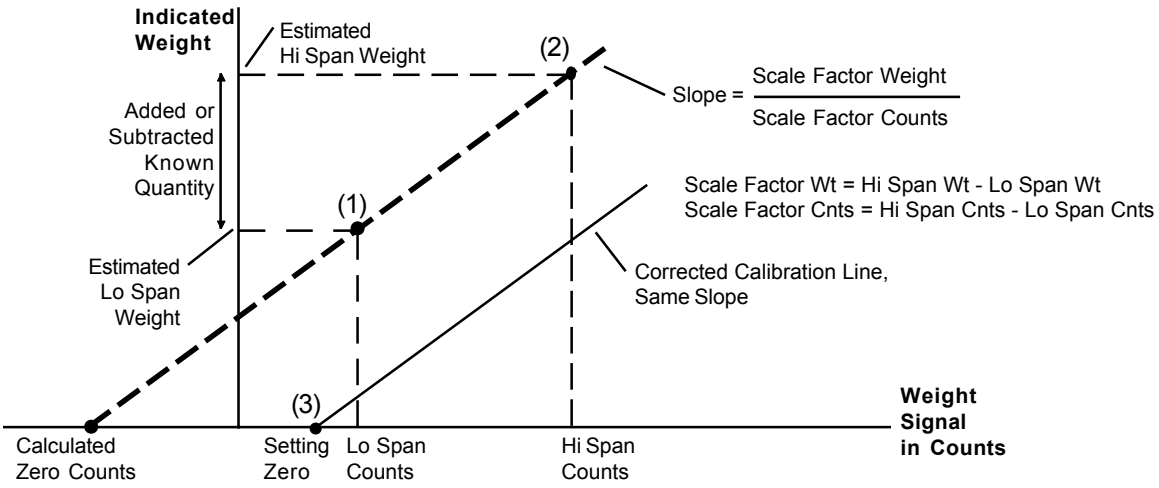
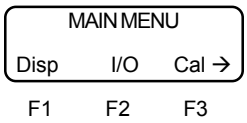
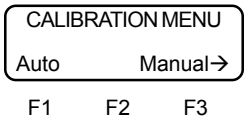


Figure 7-3. Calibration by Adding or Subtracting a Known Quantity of Material

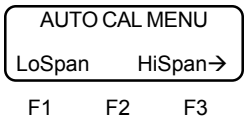
3. Press the Menu Key to display the *Main* Menu. The display shows:



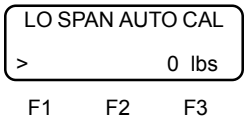
4. Press the F3 Key to access the *Cal* Menu. The display shows:



5. Press the F1 Key to access the *Auto* Menu. The display shows:

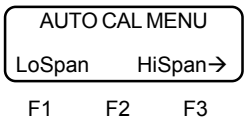


6. Press the F1 Key to access *LoSpan*. The display looks like this:



(Units are consistent with *Units* Menu.)

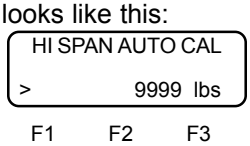
7. Use the keypad or Arrow Keys to input a value that represents the estimated quantity of material in the vessel. Press the Enter Key. The display acknowledges the entry and returns to:



Note

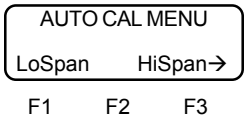
If the filling process takes a long time **and** you need to use the MVS to monitor vessel contents during filling, enter *ScfCnt*, *ScfWgt*, and then *Zero_Cal* now. (If you do not, disregard channel monitoring data until you complete the *Auto* Calibration in Steps 8 through 10.) Complete the *Auto* calibration as described below.

8. Add a known quantity of material, representing at least 25% of the vessel's total capacity, to the vessel.
9. Press the F3 Key to access *HiSpan*. The display looks like this:



(Units are consistent with *Units* Menu.)

10. Using the keypad or Arrow Keys, input the value equal to the sum of the known quantity (Step 8) and the estimated quantity (Step 7). Press the Enter Key. The display acknowledges the entry and returns to:



11. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

Note

Shifting from the dashed to the solid line in Figure 7-3 is accomplished by setting zero when the vessel contains a known quantity of material (usually none) at a later date. The procedure is described in *Refining the Calibration by Setting Zero* in this section.

Calibration by Subtracting a Known Quantity of Material

This calibration method does not require the vessel to be empty. This method of calibration is appropriate when it is easier to remove material from the vessel than to add it. The principle behind the calibration follows.

A value estimated to be the quantity of material in the vessel is entered as the Hi Span weight [point (2) in Figure 7-3]. A known quantity of material, representing at least 25% of the vessel's total capacity, is removed from the vessel. The estimated Hi Span weight minus the known quantity that is removed is entered as the Lo Span weight [point (1) in Figure 7-3]. The MVS saves in memory the Lo Span and Hi Span weights as well as the digital counts associated with each weight. These values define the dashed straight line and the calculated zero counts shown in Figure 7-3. The slope of the line is called the Scale Factor, which is calculated internally.

The slope of the line is reasonably accurate, because it is calculated based on the known difference between the Lo Span and Hi Span weights and counts. However, if the estimated Hi Span weight is incorrect, the actual 'location' of the line is incorrect, resulting in

errors in channel monitoring. The greater the error in the estimated Hi Span, the greater the resulting error. The 'location' of the line can be adjusted to the solid line by setting zero [point (3) in Figure 7-3] (see *Refining the Calibration by Setting Zero* in this section).

Similar to the other calibration methods, the greater the known quantity of material moved during the calibration procedure, the greater the accuracy. Removing 50% of the total capacity results in greater accuracy than removing 25% of the total capacity.

Follow this procedure to calibrate by subtracting a known quantity of material:

1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:

```
MAIN MENU
Disp      I/O      Cal →
F1        F2       F3
```

4. Press the F3 Key to access the *Cal* Menu. The display shows:

```
CALIBRATION MENU
Auto              Manual→
F1        F2      F3
```

5. Press the F1 Key to access the *Auto* Menu. The display shows:

```
AUTO CAL MENU
LoSpan        HiSpan→
F1        F2      F3
```

6. Press the F3 Key to access *HiSpan*. The display looks like this:

```
HI SPAN AUTO CAL
>              9999 lbs
F1        F2      F3
```

   (Units are consistent with *Units* Menu.)
7. Use the keypad or Arrow Keys to input a value that represents the estimated quantity of material in the vessel. Press the Enter Key. The display acknowledges the entry and returns to:

```
AUTO CAL MENU
LoSpan        HiSpan→
F1        F2      F3
```

Note

If the removal process takes a long time **and** you need to use the MVS to roughly monitor vessel contents during removal, enter *ScfCnt*, *ScfWgt*, and then *Zero_Cal* now. (If you do not, disregard channel monitoring data until you complete the *Auto* Calibration in Steps 8 through 10.) Complete the *Auto* calibration as described below.

8. Remove a known quantity of material, that represents at least 25% of the vessel's total capacity, from the vessel.
9. Press the F1 Key to access *LoSpan*. The display looks like this:

```
LO SPAN AUTO CAL
>                 0 lbs
F1        F2      F3
```

   (Units are consistent with *Units* Menu.)
10. Using the keypad or Arrow Keys, input a value equal to the estimated quantity (Step 7) minus the known quantity (Step 8). Press the Enter Key. The display acknowledges the entry and returns to:

```
AUTO CAL MENU
LoSpan        HiSpan→
F1        F2      F3
```

11. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

Note

Shifting from the dashed to the solid line in Figure 7-3 is accomplished by setting zero when the vessel contains a known quantity of material (usually none) at a later date. This procedure is described in *Refining the Calibration by Setting Zero* in this section.

Refining the Calibration by Setting Zero

Zero_Cal is used to allow the MVS to establish a known live load. Setting zero translates the calibration line of Figure 7-3 from the dashed line to the solid line position. Entering a weight value in *Zero_Cal* establishes point (3) in the figure. This weight must be entered only when there is a known

quantity of material in the vessel (**usually** zero material, but it can be a known, non-zero quantity). *Zero_Cal* is often entered at some time after the initial installation and calibration, when it is practical to empty the vessel and refine the calibration.

Zero_Cal may be used to compensate for the following circumstances:

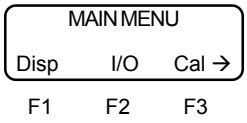
- The estimated weight used when performing a calibration by adding or subtracting a known quantity of material is off by a greater margin than can be tolerated.
- The vessel was not completely empty at the start of a high-accuracy calibration procedure.

Note

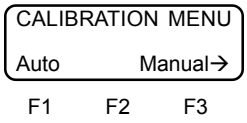
The *Zero_Cal* function cannot 'repair' a calibration in which the known quantity added or subtracted was actually incorrect, because the slope of the line is not affected by setting zero. If necessary, recalibrate.

Follow this procedure to refine the calibration by setting zero:

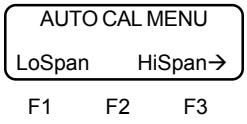
1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



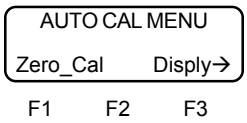
4. Press the F3 Key to access the *Cal* Menu. The display shows:



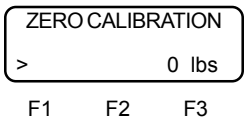
5. Press the F1 Key to access the *Auto* Menu. The display shows:



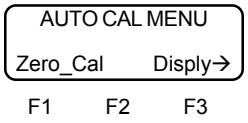
6. Press the Menu Key to access the menu's second page. The display shows:



7. Press the F1 Key to access *Zero_Cal*. The display looks like this:



(Units are consistent with *Units* Menu.)
8. Use the keypad or Arrow Keys to input a value that represents the known quantity of material (usually zero) in the vessel. Press the Enter Key. The display acknowledges the entry and returns to:



The MVS automatically makes all the necessary corrections. However, the entered values of Lo Span and Hi Span weight remain in memory even though the solid line of Figure 7-3 does not pass through those two points. Those points are used only to establish the slope of the line.
9. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

Displaying Auto Calibration Parameters

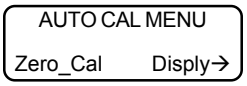
The second page of the *Auto Cal* Menu has a display function. *Disply* allows you to view the following calibration values, which have been entered or internally calculated:

- *Cnts/mV* (digital counts per millivolt of signal)
- *0mV cnts* (digital counts corresponding to 0 millivolts of signal)
- *H_SPAN_W* (entered hi span weight)
- *L_SPAN_W* (entered lo span weight)
- *H_SPAN_C* (hi span counts = digital counts corresponding to hi span weight)
- *L_SPAN_C* (lo span counts = digital counts corresponding to lo span weight)
- *ZERO_WGT* (entered zero calibration weight if performed Zero_Cal; otherwise, zero)
- *ZERO_CNT* (zero counts = digital counts corresponding to zero calibration weight)
- *SCF_WGT* (scale factor weight = hi span weight - lo span weight)
- *SCF_CNT* (scale factor counts = hi span counts - lo span counts)

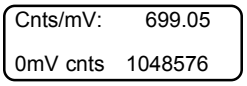
- *A_SCF_C* (analog scale factor counts, calculated internally based on STX PCB's analog calibration; only applicable when STX PCB is in Analog Mode)
- *A_ZERO_C* (analog zero counts, calculated internally based on STX PCB's analog calibration; only applicable when STX PCB is in Analog Mode)

Follow this procedure to display the auto calibration parameters:

1. While in the *Auto Cal* Menu, access the second page by pressing the Menu Key until the display shows:



2. Press the F3 Key to access *Disply*. The display looks like this:



3. Press any key other than the Esc or Auto/Man Key to cycle through the parameters.
4. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

Resetting Auto Calibration Parameters

The third page of the *Auto Cal* Menu has a reset function. Use this menu to reset the calibration to the default, listed below:

- *Cnts/mV* — dependent on *Gain* value (see Chapter 8, MVS-STX Service Menu). Value is 699.05 for the default *Gain* of 2.
- *0mV cnts* — 1,048,576
- *H_SPAN_W* — 9,999*
- *L_SPAN_W* — 0
- *H_SPAN_C* — 1,298,576
- *L_SPAN_C* — 1,048,576
- *ZERO_WGT* — 0
- *ZERO_CNT* — 1,048,576
- *SCF_WGT* — 9,999*
- *SCF_CNT* — 250,000

*Decimal point/dummy zeroes are consistent with *Form*.

Note

Reset has no affect on analog scale factor counts and analog zero counts.

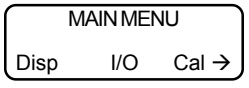
Manual

For manual calibration, you calculate and input directly the slope and setting zero point of the calibration line. There are three reasons for performing manual calibration instead of automatic calibration:

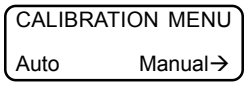
- You cannot move any material now, and want to get started using your system with a pre-calibration.
- You calibrated the system. Later, you moved material into an empty vessel and kept an accurate record of actual material weight (based on a truck weight or some other accurate information) and indicated material weight (from the MVS). However, you did not perform an *Auto Cal* at the time. You want to use this information now to refine the calibration.
- You want to re-enter data from a previous calibration.

Calculation of manual calibration parameters for pre-calibration and calibration refining is covered in Appendix C, Calculation of Manual Calibration Parameters. Once you have calculated the parameters, follow the procedure below to perform a manual calibration:

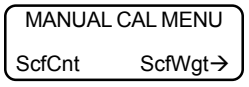
1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



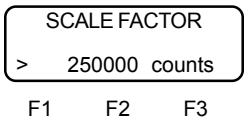
4. Press the F3 Key to access the *Cal* Menu. The display shows:



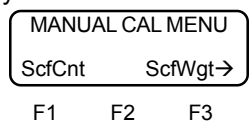
5. Press the F3 Key to access the *Manual* Menu. The display shows:



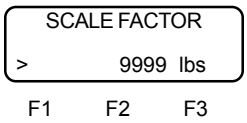
6. Press the F1 Key to access *ScfCnt*. The display looks like this:



7. Use the keypad or Arrow Keys to input a value for the scale factor counts. Press the Enter Key. The display acknowledges the entry and returns to:

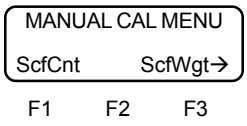


8. Press the F3 Key to access *ScfWgt*. The display looks like this:

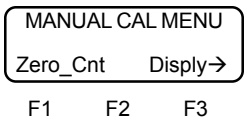


(Units are consistent with *Units* Menu.)

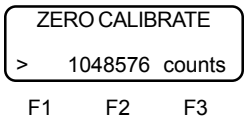
9. Use the keypad or Arrow Keys to input a value for the scale factor weight. Press the Enter Key. The display acknowledges the entry and returns to:



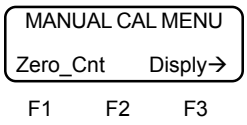
10. Press the Menu Key to go to the menu's second page. The display shows:



11. Press the F1 Key to access *Zero_Cnt*. The display looks like this:



12. Use the keypad or Arrow Keys to input a value for zero counts (counts associated with zero live load). Press the Enter Key. The display acknowledges the entry and returns to:



13. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

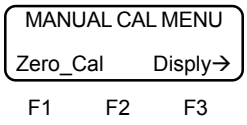
Displaying Manual Calibration Parameters

The second page of the *Manual Cal* Menu has a display function. *Disply* allows you to view the following calibration values, which have been entered or internally calculated:

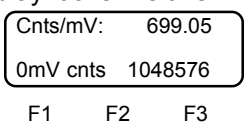
- *Cnts/mV* (digital counts per millivolt of signal)
- *0mV cnts* (digital counts corresponding to 0 millivolts of signal)
- *H_SPAN_W* (hi span weight) — shows '--' after manual calibration
- *L_SPAN_W* (lo span weight) — shows '--' after manual calibration
- *H_SPAN_C* (hi span counts) — shows '--' after manual calibration
- *L_SPAN_C* (lo span counts) — shows '--' after manual calibration
- *ZERO_WGT* (zero calibration weight, which is zero for manual calibrations)
- *ZERO_CNT* (entered counts corresponding to zero live load)
- *SCF_WGT* (entered scale factor weight)
- *SCF_CNT* (entered scale factor counts)
- *A_SCF_C* (analog scale factor counts, calculated internally based on STX PCB's analog calibration; only applicable when STX PCB is in Analog Mode)
- *A_ZERO_C* (analog zero counts, calculated internally based on STX PCB's analog calibration; only applicable when STX PCB is in Analog Mode)

Follow this procedure to display the manual calibration parameters:

1. While in the *Manual Cal* Menu, access the second page by pressing the Menu Key until the display shows:



2. Press the F3 Key to access *Disply*. The display looks like this:



3. Press any key other than the Esc or Auto/Man Key to cycle through the parameters.
4. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

Resetting Manual Calibration Parameters

The third page of the *Manual Cal* Menu has a reset function. Use this menu to reset the calibration to the defaults, listed below:

- *Cnts/mV* — dependent on *Gain* value (see Chapter 8, MVS-STX Service Menu). Value is 699.05 for the default *Gain* of 2.
- *0mV cnts* — 1,048,576
- *H_SPAN_W* — 9,999*
- *L_SPAN_W* — 0
- *H_SPAN_C* — 1,298,576
- *L_SPAN_C* — 1,048,576
- *ZERO_WGT* — 0
- *ZERO_CNT* — 1,048,576
- *SCF_WGT* — 9,999*
- *SCF_CNT* — 250,000

*Decimal point/dummy zeroes are consistent with *Form*.

Note

Reset has no affect on analog scale factor counts and analog zero counts.

Linear

This function corrects nonlinearities from a vessel's sensor output. Use of this function may be required if you notice one of the following after the system is correctly calibrated (using *Auto* Calibration):

- The MVS gives accurate results when the live load is close to 0 and close to the full scale (maximum live load) value, but is **consistently** inaccurate between those values.
- The MVS gives accurate results over some or most of the live load range, but is **consistently** inaccurate in one area.

The word 'consistent' refers not only to an error occurring, but that the error is approximately the same each time. This type of error may be caused by a non-linear response of the vessel's structure to changes in load. This type of error can also result from layering of multiple types of material in the vessel, with differing densities, in distinct, consistently defined layers.

Note

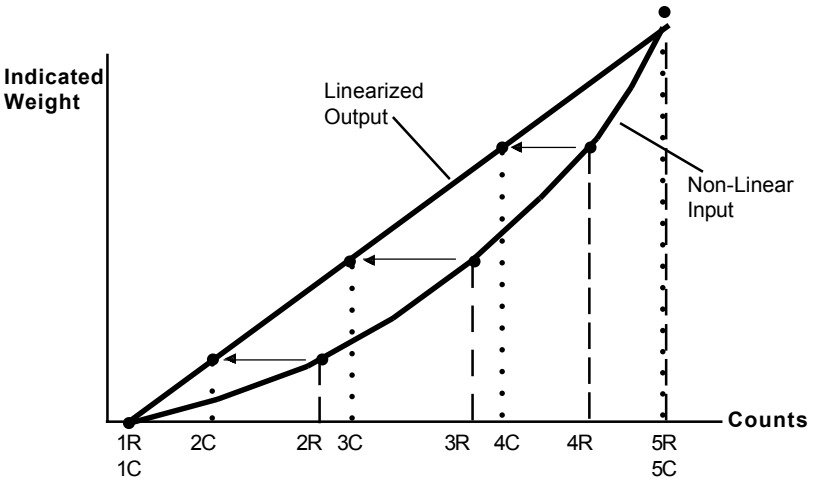
Changing the linearization table incorrectly can cause the MVS to display incorrect weight. Do not change the linearization table unless one of the above problems has been noted.

The MVS's linearization algorithm uses a five-point piece-wise linearization method with linear interpolation between points. Figure 7-4 illustrates the linearization operation. Table 7-1 is the default linearization table, consisting of five raw digital count values as inputs and five corrected digital count values as outputs. The default for *Linear* is *Off*. Additionally, the raw and corrected default values are identical, so the default linearization table has no effect, even if linearization is *On*.

Raw Value	Corrected Value
1048576	1048576
1112576	1112576
1176576	1176576
1240576	1240576
1304576	1304576

Table 7-1. Default Linearization Table

Consult with K-M to determine the values to input for linearization.



Linearizing Table

Raw Input	Corrected Output
1R	1C
2R	2C
3R	3C
4R	4C
5R	5C

Requirements of table values:
1R<2R<3R<4R<5R
1C<2C<3C<4C<5C
1R=1C
5R=5C

Figure 7-4. Linearization Curve

Following is an example where use of the linearization table may be required:

Example: When the vessel is empty, the display correctly shows approximately 0 lbs. You start putting truckloads of material into the vessel, and notice the following pattern:

Truck	Total Actual Load	Total Indicated Load
	0	0
1	5,000	6,000
2	10,000	11,500
3	15,000	16,000
4	20,000	20,000

After the fourth truckload, the indicated load from the MVS is reasonably accurate. You notice this same pattern and magnitude of errors each time you start with an empty vessel.

Follow this procedure to set up and enable the linearization table:

1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:

   MAIN MENU
   Disp I/O Cal →
   F1 F2 F3
4. Press the F3 Key to access the *Cal* Menu. The display shows:

   CALIBRATION MENU
   Auto Manual→
   F1 F2 F3
5. Press the Menu Key to display the menu's second page. The display shows:

   CALIBRATION MENU
   Linear →
   F1 F2 F3
6. Press the F1 Key to access the *Linear* Menu. The display shows:

   LINEARITY MENU
   On Off* Set
   F1 F2 F3

   (Asterisk indicates current selection for *On* or *Off*.)
7. Press the F3 Key to access the *Set* Menu. The display looks like this:

   Pt RAW INPUT
   1 > 1048576 Cnts
   F1 F2 F3
8. Use the keypad or Arrow Keys to enter a new value for *Raw Input*. Press the Enter Key. The display acknowledges the entry and switches to a display that looks like this:

   Pt CORRECTED OUT
   1 > 1048576 Cnts
   F1 F2 F3
9. Use the keypad or Arrow Keys to enter a new value for *Corrected Output*. Press the Enter Key. The display acknowledges the entry and returns to the *Raw Input* screen for point 1.
10. Press the F1 Key to move on to point 2. The display looks like this:

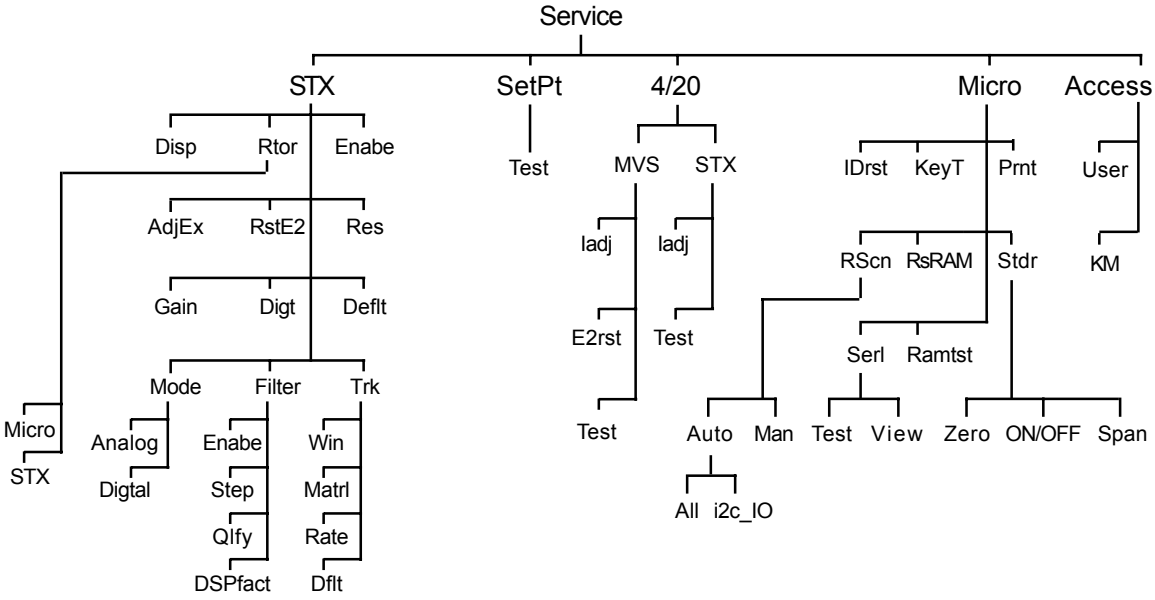
    Pt RAW INPUT
    2 > 1112576 Cnts
    F1 F2 F3
11. Repeat Steps 8 through 10 until setup of the linearization table is complete.
12. Press the Esc Key. The display shows:

    LINEARITY MENU
    On Off* Set
    F1 F2 F3

    (Asterisk indicates current selection for *On* or *Off*.)
13. Press the F1 Key to enable linearization. The display acknowledges the selection and returns to:

    LINEARITY MENU
    On* Off Set
    F1 F2 F3
14. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

Chapter 8. MVS-STX Service Menu



STX: display A/D counts; download calibration to new PCB; enable/disable channel; default STX; adjust excitation, resolution, gain and active digits; select analog or digital mode; set up filtering and tracking
SetPt: test setpoints
4/20: enter digital calibration values, test, and default current outputs
Micro: reset ID, test keyboard, print setup information, rescan PCB and slave devices, reset RAM, standardize STX PCB, test and view serial communications, test RAM
Access: set up access code and enter K-M Mfg Code

Figure 8-1. Service Menu Tree

Introduction

The *Service* Menu is used to set up a user-defined access code and perform troubleshooting functions. This chapter provides explanation of the *Service* Menu parameters. Additionally, navigation procedures through the menu tree are provided for some functions.

As shown in Figure 8-1, the *Service* Menu has five submenus:

- *STX* — display weight and A/D counts; download calibration information to a new STX PCB or microprocessor PCB; enable/disable channel monitoring; adjust excitation; reset STX PCB default parameters; adjust resolution, gain, and number of active digits; select analog or digital mode; and set up and enable filtering and tracking parameters that reduce effects of 'noise' and drift.
- *SetPt* — turn setpoint relays on and off for test purposes.
- *4/20* — calibrate 4/0 and 20 mA outputs, reset current output default parameters, and set current transmitter output to specific values for test purposes.
- *Micro* — clear 16-character customer-defined ID, test keyboard, print setup information, rescan PCB and slave device addresses, reset non-volatile RAM to default parameters, standardize STX PCB, test and view serial communications, and test non-volatile RAM.
- *Access* — set up user-defined access code; enter K-M Mfg Code to perform certain troubleshooting functions.

Note

Do not modify *Service* parameters unless you are familiar with MVS-STX operation or have been instructed by a trained operator or K-M personnel.

To set up a user-defined access code, proceed directly to *Access* in this chapter.

K-M Service Code

The K-M Service Code is required to change some parameters within the *Service* Menu unless you entered the K-M Mfg Code. The Service Code is:

9010

You can view parameters in the *Service* Menu without entering the Service Code, but will be prompted to enter the Code if you try to change certain parameters. Once the Service Code is entered, you have access to all functions that require the Code, while you remain within the Manual Mode. You only need to enter the Code once per Manual Mode session, regardless of the number of functions and channels you access.

STX

This menu is used to:

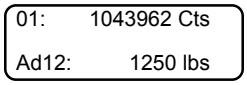
- display material weight and A/D counts
- download calibration information to a new STX PCB or microprocessor PCB
- enable or disable monitoring for a channel
- adjust excitation
- reset the STX PCB to default parameters
- adjust resolution, gain, and active digits
- set (or reset) channel default parameters
- select analog or digital mode
- set up and enable filtering and tracking parameters to reduce the effects of 'noise' and drift

Descriptions of the submenus follow.

Disp (display)

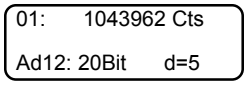
This function displays material weight, 'raw' and 'corrected' A/D counts, and stability. 'Corrected' counts are calculated after all corrections, such as averaging and linearization, are applied. 'Raw' counts are the counts before any corrections are applied.

The first page of the display looks like this:



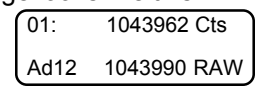
- *01* is the factory-set channel ID
- *1043962 Cts* is the 'corrected' counts
- *12* is the STX PCB's hexadecimal address — first rack ('1'), second position in rack ('2')
- *1250 lbs* is the current material weight

Display the remaining pages by pressing the F3 Key. The second page looks like this:



- *20Bit* is the effective resolution
- *d=5* is the change in counts. K-M may be interested in this number if the channel monitoring display jumps or drifts excessively. When d exceeds 255, the number is replaced by ***. d is zeroed by pressing the Enter Key while viewing this display.

The third page looks like this:



- *1043962 Cts* is the 'corrected' counts
- *1043990 RAW* is the 'raw' counts

The fourth and fifth pages show the digital offset *DOF* and analog offset *AOF*. These are correction offset values used for material tracking (refer to *Trk* in this chapter).

Press the Arrow Keys to cycle through all other STX channels.

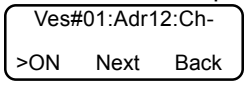
Rtor (restore)

This function downloads calibration information to a new STX or microprocessor PCB, eliminating the need to reenter parameters individually. *Rtor* has two submenus:

- *Micro* — copy calibration from the STX PCB to the microprocessor PCB
- *STX* — copy calibration parameters from the microprocessor PCB to the STX PCB

Enab (enable)

This function enables or disables the channel. *Enab* differs from *Hide* (see Chapter 5, MVS-STX Display Menu) in that disabling a channel with *Enab* actually causes the MVS to stop monitoring the channel. The display shows:



- *01* is the factory-set channel ID for the first channel in the system
- *12* is the signal processor PCB's hexadecimal address — first rack ('1'), second position in rack ('2')

Press the F1 Key to enable (*ON*) and disable (*OFF*) the channel. Press the F2 (*Next*) and F3 (*Back*) Keys to cycle through all other channels in the MVS.

AdjEx (adjust excitation)

AdjEx adjusts the STX PCB's excitation voltage output, which is used to excite the sensors. *AdjEx* can range from 0 to 255, corresponding to approximately 5 to 12.9 Volts. The default, which varies slightly for each STX PCB, is approximately 236. This corresponds to the 12 Volts required by K-M silicon sensors without Intrinsically Safe (IS) Barriers. Foil gage sensors typically require 10 Volts of excitation; refer to the manufacturer's data sheet for recommended excitation.

Note

If using IS Barriers, it may be necessary to lower the excitation voltage.

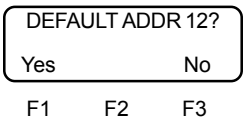
Press the F2 and F3 Keys for coarse adjustment or the Arrow Keys for fine adjustment of *AdjEx*. Press the Enter Key to save the new value in memory.

The value for excitation voltage output applies only to the STX PCB for the current channel.

RstE2 (reset EEPROM)

This function resets most parameters (calibration, filtering, tracking, STX PCB's current output, etc.) on the STX PCB for the current channel to factory-set default values. *RstE2* does not reset *AdjEx* or *Iadj*. Additionally, *RstE2* has no effect on parameters residing on other PCBs, such as current outputs and setpoints.

The display looks like this:



Addr 12 is the STX PCB's hexadecimal address — first rack ('1'), second position in rack ('2').

Press the F1 Key to default the STX PCB. Press the F3 Key to exit without defaulting.

Res (resolution)

This function controls effective resolution by changing the conversion rate of the 21-bit A/D converter. In general, the higher the resolution, the slower the STX conversion time (and time to switch monitoring channels), but the greater the stability. Table 8-1 shows the effective resolution and associated conversion times.

You can select from *16 bt*, *17 bt*, *18 bt*, *19 bt*, *20 bt*, and *21 bt*. The default is *20 bt*.

The value for resolution applies only to the STX PCB for the current channel.

Effective Resolution (bits)	**Conversion Time** (mS)
16	25
17	50
18	83
19	125
20	250
21	512

Table 8-1. Effective Resolution

Gain

Adjusting the gain increases or decreases system sensitivity. The type of sensors connected to the STX determines the required gain. For example, for a nominal excitation output of 12 volts, the reference voltage is one quarter of the excitation voltage, or 3 volts. At a gain of 1, the A/D converter spreads 2,097,152 counts over a range of ± 3 volts. A gain of 2 spreads the counts over a range of ± 1.5 volts, doubling the sensitivity. A gain of 4 spreads the counts over a range of ± 0.75 volts, doubling the sensitivity again, etc.

The default setting is 2, appropriate for K-M Microcell and L-Cell sensors. A gain of 4 is appropriate for K-M Load Disc II, Load Stand II, and Load Link I and II sensors. See Table 8-2 for the available gain settings and corresponding sensor input voltages.

The value for *Gain* applies only to the STX PCB for the current channel.

Gain	**Sensor Input Voltage**
2	±1.5
1	±3.0
4	±0.75
8	±0.375
16	±0.1875
32	±0.09375
64	±0.046875
128	±0.0234375

Table 8-2. Amplifier Gain

Digt (active digits)

This function sets the number of active digits for input values. Note that active digits do not include fixed zeros (refer to *Form* in Chapter 5, MVS-STX Display Menu). You can select from 4, 5, and 6. The default is 5.

The value for *Digt* applies only to the STX PCB for the current channel.

Deflt (default)

This function is used to:

- reset *Gain*, *Res*, and *Digt* for the STX to factory-set default values, or
- set default values for *Gain*, *Res*, and *Digt* if you add an STX PCB to an MVS or add serial communications for an STX to the MVS.

The defaults for gain, resolution, and active digits vary, depending on sensor type. *Deflt* selections and corresponding values are shown in Table 8-3.

	Gain	*Res* (bits)	*Digt*
MC4	2	20	4
DS4	4	20	4
DS5	4	21	5
FG5	32	21	5
FG6	64	21	6

Legend:
MC=K-M Microcells or L-Cells
DS=K-M direct support Load Stand II, Load Disc II, or Load Link I and II
FG=full bridge, foil gage sensors

Table 8-3. Default Values

Mode

This function selects the operation mode — *Analog* or *Digtal* (digital). In analog mode, the STX PCB's current output is controlled by the 'analog engine,' calibrated with switches on the PCB. In digital mode, the STX PCB's current output is controlled by the 'digital engine,' calibrated using the MVS menu tree. The default is *Analog*. The selection for *Mode* applies only to the current channel.

Filter

Vibrations in a vessel can cause changes in the weight display and outputs, even though no material is moved, because the vibrations affect the vessel's structural response. The **Sentry™** *Filter* reduces display and output changes that can result from vibration. The principle behind the filtering follows.

The A/D converter digitizes the signal coming from a sensor. The STX picks the first signal as a reference median; this value is used in calculating the displayed weight. As shown in Figure 8-2, the STX then compares following signals to the reference median, and recalculates the reference median when either of the following happen:

- the number of successive signals above or below the median exceeds a triggering number
- a signal falls outside of a user-defined window around the reference median

When the STX recalculates the reference median, the displayed weight changes to correspond to the new reference median. *Filter* affects setpoints, current outputs, and serial output as well as the channel monitoring display. The selections for *Filter* apply only to the current channel.

Filter has four submenus:

Enabe (enable)

Enabe turns the filter on and off. The default is *Off*.

Step

Step is a window of equal counts above and below the reference median. As shown in Figure 8-2, example 1, if a large signal change is detected that falls outside the window, the STX immediately moves the location of the reference median to that point. This allows the STX to adjust quickly to rapid material movement. The default is 15,000 counts.

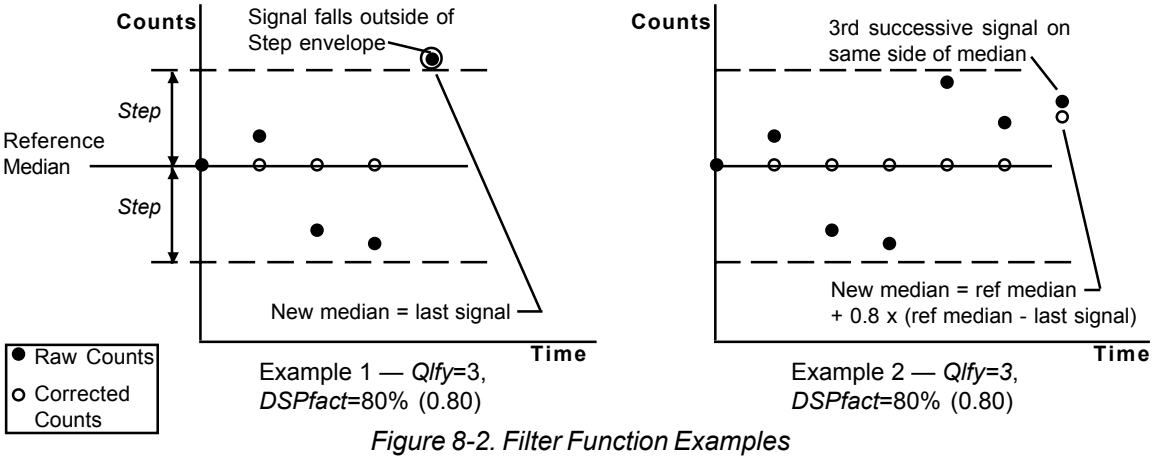


Figure 8-2. Filter Function Examples

Qlfy (qualify)

Qlfy is the triggering number of successive signals above or below the median signal value, but within the *Step* window. In example 2 in Figure 8-2, *Qlfy* is 3. When the third successive signal above the median (but within the *Step* window) is detected, the STX moves the location of the median value to that point (or a percentage of the distance from the old median as determined by *DSPfact*). This allows the STX to respond to definite trends in weight changes. The default is 3.

DSPfact (DSP factor)

DSPfact determines the magnitude of change from the old to the new reference median, for change triggered by *Qlfy*. In Figure 8-2 example 2, the STX moves the reference median 80% of the distance from the old median to the last signal (which triggered the change), based on a *DSPfact* of 80%. A value of 100% sets the new median to the last signal value; a value of 50% sets the new median halfway between the old median and the last signal value. Note that *DSPfact* does not affect the change caused by a signal falling outside the *Step* window, as shown in example 1 in Figure 8-2. The default is 80%.

Trk (track)

Tracking provides the ability to reject sensor drift and other related long-term errors while preserving the displayed and output weight's stability and accuracy. Discrimination between material movement and sensor drift is accomplished by calculating the rate of change of the sensor input signal every ten seconds, and comparing this rate to a user-defined threshold rate. The STX stops tracking when the rate of change exceeds the threshold rate, indicating that material is actually moving. Additionally, discrimination between slow material loss (such as from a leak) or gain and sensor drift is accomplished by comparing the total drift to a drift limit. The STX limits the maximum correction to this limit, so tracking does not mask real material loss/gain. There are two aspects to tracking — zero tracking and material tracking. See Figure 8-3:

- **Zero tracking** establishes a user-defined window around the voltage associated with zero live load. When the raw voltage falls inside the window (usually indicating a negligible amount of material in the vessel) and the rate of change is below the threshold rate, the corrected voltage and counts remain constant as those associated with zero live load, and the displayed weight remains at zero. The correction is done by the algebraic addition of a correction offset value to the A/D converter output. If the raw voltage falls outside the window on the negative side, the STX resets the zero calibration point to that raw voltage, and sets the window around the new zero calibration point. Unlike *Zclmp* (see Chapter 5, MVS-STX Display Menu), zero tracking affects setpoints, current output, and serial output as well as the channel monitoring display.

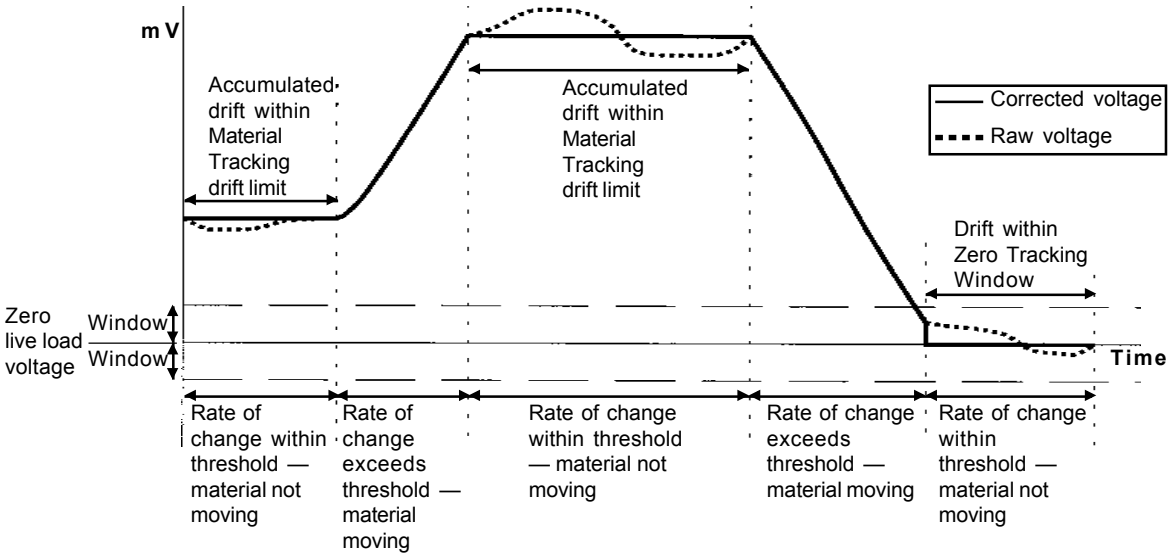


Figure 8-3. Material and Zero Tracking Example

- **Material tracking** establishes a reference when material movement within a vessel has become stable (rate of change is below the threshold) during filling and batching processes. This reference is then used to maintain and hold steady the outputs. When the change in raw voltage falls within the drift limit (factory set at ± 5.00 mV), the corrected voltage and counts remain those associated with the reference weight. The correction is done by the algebraic addition of a correction offset to the A/D converter output. The maximum accumulated correction offset is limited to ± 5.0 mV. If the accumulated drift exceeds 5.0 mV, the STX begins tracking the material movement, which may be caused by a slow leak in the vessel. Material tracking affects setpoints, current output, and serial output as well as the channel monitoring display.

The selections for *Trk* apply only to the current channel.

Tracking can be used in any of the following combinations:

- No zero or material tracking
- Zero tracking only
- Material tracking only
- Zero tracking and material tracking

Trk has four submenus:

Win (window size)

This function sets the maximum plus or minus offset value for zero tracking. If the minus offset value is exceeded, the MVS resets the zero calibration point. The default is .00 mV — at this value, zero tracking is turned off.

Matrl (material tracking enable)

This function turns material tracking on and off. The default is *Off*.

Rate

This function sets the threshold rate in uV/sec for both zero and material tracking. When the rate of change exceeds this value, indicating that material is actually moving, the STX stops tracking until the rate of change again falls below this value. The default is ± 5.0 uV/sec.

Dflt (default)

This function resets the zero and material tracking parameters to factory-set defaults.

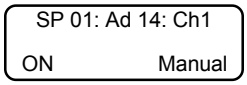
SetPt (setpoint relays)

This menu turns the setpoint relays on and off for test purposes. The MVS displays a warning that automatic control of the setpoints assigned to the currently selected channel is transferred to manual control, and requests verification.

CAUTION

Manually activating setpoint relays may cause damage if control equipment is connected. Disconnect control equipment before proceeding.

A typical setpoint test display looks like this:



- *SP 01* is the setpoint reference number (referred to as SP1 in the *I/O* Menu).
- *Ad 14* is the Relay Output PCB's hexadecimal address — first rack ('1'), fourth position in the rack ('4').
- *Ch1* is the setpoint channel number on the Relay Output PCB — each Relay Output PCB has eight channels.
- *ON* indicates setpoint status. Press the F1 Key to toggle between *On* and *Off.*
- *Manual* is not functional at this time.

Press the Arrow Keys or Enter Key to toggle between the setpoints for the current channel.

Press the Esc or Auto/Man Key to terminate the test. Once the test is terminated, the setpoints return to automatic control.

4/20

This menu allows you to:

- calibrate the 4/0 and 20 mA output to the device that is receiving the current output
- reset the current output to default parameters (MVS only; does not apply to current output on STX PCB)
- set the current output to specific values for test purposes

Selection of *MVS* or *STX* in the *4/20* Menu determines the PCB for which the current output is calibrated, reset, or tested:

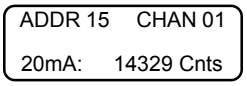
- *MVS* — current output is calibrated, reset, or tested on one of the current output channels on a Current Output PCB in the MVS. The *MVS* Menu has three submenus: *Iadj*, *E2rst*, and *Test*.
- *STX* — current output is calibrated or tested on the one current output channel on the STX PCB. The *STX* Menu has two submenus: *Iadj* and *Test*.

Iadj (adjust current output)

This menu manually assigns counts-to-milliamps outputs for 0 mA, 4 mA, and 20 mA outputs to calibrate to another device. Follow the procedure below for the *MVS* Menu or *STX* Menu:

MVS Menu

1. Put the MVS in Manual Mode. Proceed to the *Main* Menu, *Service* Menu, *4/20* Menu, *MVS* Menu, and *Iadj* Menu. The display looks like this:



   - *ADDR 15* is the Current Output PCB's hexadecimal address. If there is more than one Current Output PCB, pressing the F1 Key cycles through all Current Output PCB addresses.
   - *CHAN 01* is the channel number on the Current Output PCB. Pressing the F3 Key cycles through all the channels on the Current Output PCB.
   - *20mA* is the current output to be calibrated. Pressing the Menu Key or Enter Key cycles through the calibration points: *0mA*, *4mA*, and *20mA*.
   - *14329 Cnts* is the counts to match the desired current (0, 4, or 20 mA, as applicable).

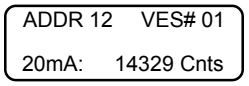
Note

If you set up 4-20 mA output, the MVS ignores entries for 0 mA. Similarly, if you set up 0-20 mA output, the MVS ignores entries for 4 mA.

2. Press the F1 key to scroll to the desired Current Output PCB in your system. Press the F3 Key to scroll to the desired channel on the Current Output PCB. Press the Enter Key to scroll to the desired current output calibration point — *0mA*, *4mA*, or *20mA*.
3. Use the Arrow Keys to change the counts while monitoring the current output of the selected Current Output channel. When the desired current output is reached, press the Enter Key to record the calibration counts in memory. The display advances to the next calibration point.
4. If desired, repeat Steps 2 and 3 for the other calibration point and for other current outputs on the Current Output PCB.

STX Menu

1. Put the MVS in the Manual Mode. Proceed to the *Main* Menu, *Service* Menu, *4/20* Menu, *STX* Menu, and *Iadj* Menu. The display looks like this:



   - *ADDR 12* is the STX PCB's hexadecimal address.
   - *VES# 01* is the channel number in the MVS.
   - *20mA* is the current output to be calibrated. Pressing the Enter Key cycles through the calibration points: *0mA*, *4mA*, and *20mA*.
   - *14329 Cnts* is the counts to match the desired current output (0, 4, or 20 mA, as applicable).

Note

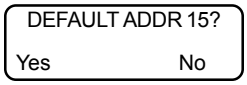
If you set up 4-20 mA output, the MVS ignores entries for 0 mA. Similarly, if you set up 0-20 mA output, the MVS ignores entries for 4 mA.

2. Press the Enter Key to scroll to the desired current output calibration point — *0mA*, *4mA*, or *20mA*.
3. Use the Arrow Keys to change the counts while monitoring the current output of the STX PCB. When the desired current output is reached, press the Enter Key to record the calibration counts in memory. The display advances to the next calibration point.
4. If desired, repeat Steps 2 and 3 for the other current output calibration point.

E2rst (EEPROM reset)

(MVS only; does not apply to current output on STX PCB)

This function resets the current output *Mode* and the *Iadj* tuning parameters for 0 mA, 4 mA, and 20 mA to default values for **all** channels on the displayed Current Output PCB. The *E2rst* display looks like this:



ADDR 15 is the Current Output PCB's hexadecimal address.

Press the F1 Key to default the current output parameters for all channels on the displayed Current Output PCB to:

- *Mode* — 4-20 mA
- Calibration values —
  20 mA value =14329 counts
  4 mA value = 3738 counts
  0 mA value = 1096 counts

The display flashes a message acknowledging the entry. Pressing the F3 Key exits the menu without defaulting.

If there are multiple Current Output PCBs, the MVS advances to the address of the next Current Output PCB.

Test

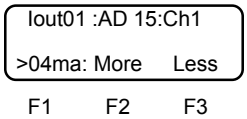
This function allows manual activation of current output channels outside of normal control. The system issues a warning that automatic control of current outputs assigned to the selected channel is transferred to manual control, and requests verification.

CAUTION

Manually activating current output can cause damage if control equipment is connected. Disconnect control equipment before proceeding.

MVS Menu

After the warning message, if more than one current output has been assigned for this channel, a selection of the two current output channels is offered. After you select a channel, a *Test* display looks like this:



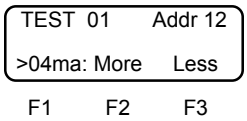
- *Iout01* and *Ch1* is the channel number on the Current Output PCB. Each Current Output PCB has eight multiplexed current output channels.
- *Ad 15* is the Current Output PCB's hexadecimal address.
- *04mA* is the current sent to the current output channel being tested. If the current mode is 0-20mA, the test current output ranges from 0 mA to 20 mA in 2 mA steps. If in the 4-20mA mode, the test current output ranges from 4 mA to 20 mA in 2 mA steps.
- *More* or *Less* refers to the increase (*More*) or decrease (*Less*) of the output. Press the F2 Key to increase output in 2 mA steps. Press the F3 Key to decrease output in 2 mA steps.

Press the Esc or Auto/Man Key to terminate the test. Once the test is terminated, the current output returns to automatic control.

To test current output for another channel assigned to this STX channel on the Current Output PCB, select *Test* again and then select the other current output channel.

STX Menu

After the warning message, a *Test* display looks like this:



- *01* is the channel number in the MVS.
- *Ad 12* is the STX PCB's hexadecimal address.
- *04mA* is the current sent to the STX PCB current output channel. If the current mode is 0-20mA, the test current output ranges from 0 mA to 20 mA in 2 mA steps. If in the 4-20mA mode, the test current output ranges from 4 mA to 20 mA in 2 mA steps.
- *More* or *Less* refers to the increase (*More*) or decrease (*Less*) of the output. Press the F2 Key to increase output in 2 mA steps. Press the F3 Key to decrease output in 2 mA steps.

Press the Esc or Auto/Man Key to terminate the test. Once the test is terminated, the current output returns to automatic control.

Micro

This menu allows you to clear the user-defined 16-character channel ID, test the keyboard, print setup information for each channel, rescan PCB and slave device addresses, reset the nonvolatile RAM to default parameters, standardize STX PCBs, test and view serial communications, and test the nonvolatile RAM. It has the following submenus:

IDrst (ID reset)

This function resets the user-defined IDs for **all** channels. After this function is used, the top line of the channel monitoring display will show only the factory-set channel ID number.

KeyT (keyboard test)

This function displays the number of the last key that was pressed. Table 8-4 lists all the keys on the MVS keypad and their corresponding reference numbers.

Key	Ref#	Key	Ref#
1(STU)	01	Menu	13
2(VWX)	02	F1	14
3(YZ)	03	F2	15
4(JKL)	04	F3	16
5(MNO)	05	*Esc	17
6(PQR)	06	*Auto/Man	18
7(ABC)	07	(Up Arrow)	19
8(DEF)	08	(Down Arrow)	20
9(GHI)	09	Tare/Net/Gross	21
0(Space)	10	⇦	22
. (Period)	11	Shift	23
- (Minus)	12	Enter	24
*Note: Press one of these keys to exit *KeyT*.			

Table 8-4. Keys and Reference Numbers

Prnt

This function prints setup information for every enabled channel. Included are calibration parameters, linearization parameters, setpoint parameters, and current output parameters.

RScn (rescan)

This function allows the MVS to automatically rescan all addresses in the system or allows you to manually rescan and modify selected addresses. *RScn* has two submenus: *Auto* and *Man*.

Auto (auto rescan)

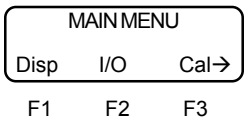
This function allows the MVS to automatically scan all addresses in the system. *Auto* has two submenus:

- *All* — If the MVS is the Master, the MVS scans I^2C and the COM1 port. If the MVS is the Slave, the MVS scans I^2C but does not scan the COM1 port.
- *i2c_IO* — The MVS scans I^2C but does not scan the COM1 port.

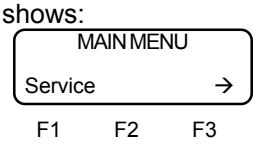
The microprocessor PCB begins the polling process with an identify command, beginning with address 1 to 7F Hexadecimal in the internal I^2C bus. Each PCB (Relay Output, Current Output, signal processor, etc.) has a unique coded response. The microprocessor PCB initializes its nonvolatile memory in accordance to these responses. Once the I^2C polling is done, external addresses through the COM1 serial port are examined (if *All* was selected).

When the MVS arrives from the factory, it is set up to recognize the addresses of all the factory-installed PCBs. However, the MVS is not able to recognize any slave devices you connect to the serial port. Additionally, if you add PCBs (Relay Output, Current Output, signal processor, etc.) to the MVS, the MVS is not able to recognize those new PCBs. Follow this procedure to enable the MVS to recognize slave devices and new PCBs:

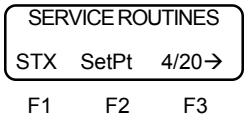
1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Press the Menu Key to display the *Main* Menu. The display shows:



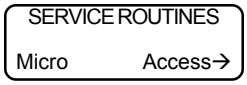
3. Press the Menu Key again to display the second page of the menu. The display shows:



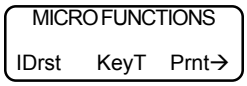
4. Press the F1 Key to access the *Service* Menu. The display shows:



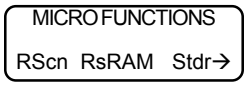
5. Press the Menu Key to display the menu's second page. The display shows:



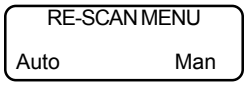
6. Press the F1 Key to access the *Micro* Menu. The display shows:



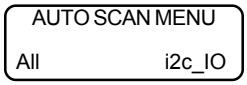
7. Press the Menu Key to display the menu's second page. The display shows:



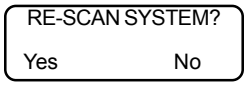
8. Press the F1 Key to access the *RScn* Menu. The display shows:



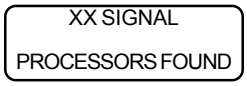
9. Press the F1 Key to access the *Auto* Menu. The display shows:



10. **To bring on-line slave devices and new PCBs**, press the F1 Key to access the *All* Menu and proceed to Steps 11 through 13.
    To bring on-line new PCBs only, press the F3 Key to access the *i2c_IO* Menu and proceed to Step 14.
11. If you selected *All* the display shows:

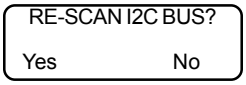


12. Press the F1 Key to select *Yes*. The MVS scans the entire network and brings on-line the slave devices and new PCBs. When the MVS is through scanning it displays the following:

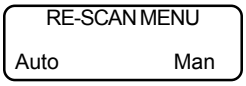


    The actual number of signal processing channels displays in place of 'XX.' Note that math channels are not considered signal processing channels.

13. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring. The remaining steps deal with rescanning the I^2C only.
14. If you selected *i2c_IO* in Step 10 the display shows:



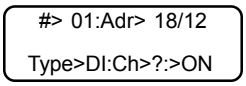
15. Press the F1 Key to select Yes. The MVS scans the entire network and brings on-line any new PCBs. The display returns to:



16. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

Man (manual rescan)

This function allows you to manually modify internal (I^2C) and external (COM1) address parameters. The MVS requires you to enter the K-M Service Code (9010) to access this function. The display looks like this:



- *#>01* is the channel number in the MVS. This number can range from 01 to 120.
- *Adr>18/12* is the signal processor decimal/hexadecimal address — I^2C address for an internal signal processor or serial address for a slave device.
- *Type>DI* is the channel type:
  MI — ADC **I**nternal (internal PCB)
  ME — ADC **E**xternal (serial slave device)
  S0 — **S**onologic 5**0**00
  S1 — **S**onologic 5**1**00
  S2 — **S**onologic 5**2**00
  S3 — **S**onologic SSU
  DI — STX **I**nternal (internal PCB)
  DE — STX **E**xternal (serial slave device)
  TI — **T**hermocouple **I**nternal
  XI — IT**X** **I**nternal (internal PCB)
  XE — IT**X** **E**xternal (serial slave device)
  MA — **Ma**th channel
  S4 — **S**onologic II
  JI — (not used)
  W2 — **W**eigh II
  10 — Model **10**00
  12 — Model **10**20
  SV — **SV**S 2000
- *Ch>?* is the channel number on the signal processor PCB. The channel number is *?* if the signal processor PCB has only one channel — for example, an STX PCB.
- *>ON* is the state of the indicated channel — *ON* or *OF* (off).

The Enter Key moves the cursor to the left of each parameter. The Function Keys also move the cursor to the left of the parameters: F1 Key for the MVS channel number, F2 Key for the type, and F3 Key for the channel state. Then the Arrow Keys scroll to the desired value.

Note

1. You must use the *Man* Menu to set up and gain access to math channels. See Chapter 9, MVS-STX Math Channels.
2. If you select math channel (*MA*) for type, the display indicates *Adr> NA* and *Ch>?,* because a math channel is not associated with a signal processor PCB.

RsRAM (reset RAM memory)

This function resets the non-volatile RAM (NVRAM) on the Microprocessor PCB. This resets **all** parameters for **all** channels in the system to the factory-set defaults (i.e., calibration, setpoint, display parameters, etc.). The MVS requires you to enter the K-M Service Code (9010) to access this function, and requests verification before it resets the NVRAM.

Stdr (standardize STX PCB)

This function provides the ability to standardize an internal STX PCB. Standardizing is initially performed at K-M. If you replace an STX PCB, using the *Stdr* Menu allows the new PCB to function identically to the replaced PCB, without recalibrating.

Consult with K-M on the use of *Stdr* if you replace an STX PCB.

Serl (serial monitor)

Serl monitors the COM1 serial port when the MVS is the Master device. *Serl* has two submenus: *Test* and *View*.

Test

Test allows you to troubleshoot serial connections between the MVS and slave serial devices. When using *Test* the MVS outputs the following serial command repeatedly:

00#ssr

To troubleshoot, follow this procedure:

1. Disconnect all but one of the slave serial devices. Set the remaining serial device's address to 0.
2. Select *Test* in the *Serl* Menu. The MVS displays *TEST TRANSMISSION IN PROGRESS XXX*, with 'XXX' replaced by the number of test transmissions sent.
3. Check the LED on the serial device — a flashing LED indicates it is responding to the serial command.
4. To exit the *Test*, press the Esc Key.
5. Repeat with the remaining slave serial devices as needed.

View

View allows you to view the serial commands in the transmit buffer and receive buffer for each channel. The display top line shows the channel number and the command in the transmit (TX) buffer. The bottom line shows the information in the receive (RX) buffer, without the initial 'A.' Pressing the Arrow Keys scrolls to other channels. Pressing the F3 Key scrolls through the string in the receive buffer if the entire string does not fit on the display.

Ramtst (RAM test)

This function performs an internal, nondestructive test on the non-volatile RAM (NVRAM) on the Microprocessor PCB. This test does not reset any parameters. Upon test completion, the display should say *Micro NVRAM Test Passed!* If it does not, contact K-M. When the test is complete, press the Esc Key to return to the *Micro* Menu.

Access

This menu allows you to:

- set a user-defined access code
- input the K-M Mfg Code, needed to perform certain troubleshooting functions.

Access has two submenus: *User* and *KM*.

User

The MVS arrives from the factory without a user-defined access code in place, allowing the user to access any function (other than those requiring K-M Mfg Code or K-M Service Code). The *User* function allows you to set up a code to limit access to changing **any** parameter (i.e., display parameters, setpoint parameters, calibration parameters, etc.).

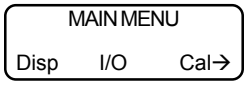
Once a User Code is in place and activated, your operator(s) will be able to view parameters in the menu tree, but will not be able to change parameters without entering the code.

Note

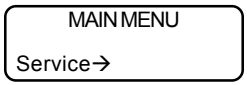
Record the access code and store it in a safe place. If misplaced, call K-M for instructions on how to bypass the code.

Follow this procedure to set up an access code:

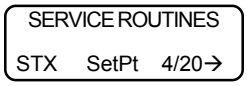
1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Press the Menu Key to display the *Main* Menu. The display shows:



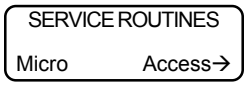
3. Press the Menu Key again to access the menu's second page. The display shows:



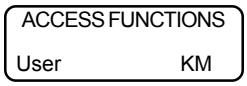
4. Press the F1 Key to access the *Service* Menu. The display shows:



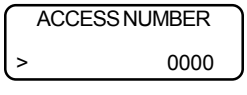
5. Press the Menu Key to access the menu's second page. The display shows:



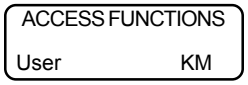
6. Press the F3 Key to go to *Access*. The display shows:



7. Press the F1 Key to go to the *User* display. The display looks like this:



8. Use the keypad to enter a one- to four-digit number. Press the Enter Key when done entering the number. The display acknowledges the entry and returns to:



9. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

The Access Code is 'activated' when you leave Manual Mode. Upon returning to Manual Mode and reentering the menu tree, the MVS prompts you to enter the code the *first* time you attempt to change a parameter. You only need to enter the code once per Manual Mode session, regardless of the number of parameters changed and channels accessed.

KM

The MVS has two factory codes. Certain troubleshooting functions require one of these codes to gain access. The Service Code was described earlier in this chapter, and is entered when prompted by the display. The KM Mfg Code is entered in the *Access* Menu.

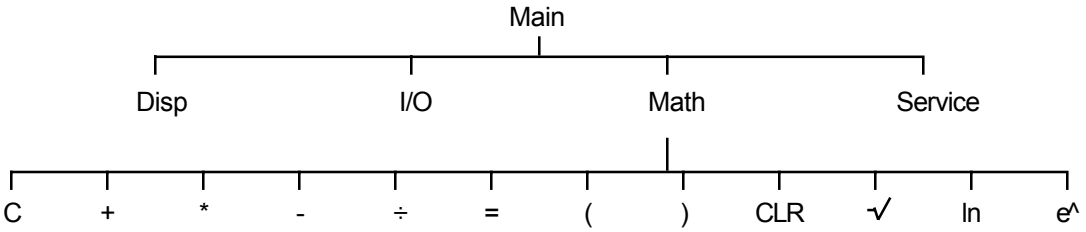
The Mfg Code is required to access hidden menus and selected other menus, which are typically only used by K-M personnel for troubleshooting and testing. The Mfg Code also allows the user to change values in the *Service* Menu. The Mfg Code is:

9111

This code is entered in the *KM* function under the *Access* Menu. Once the code is entered, you have access to all functions and hidden menus that require the code, while you remain in Manual Mode. You only need to enter the code once per Manual Mode session, regardless of the number of functions and channels you access.

The Mfg Code has precedence over the Service Code. If you enter the Mfg Code, the MVS will not require you to enter the Service Code to change values in the *Service* Menu.

Chapter 9. MVS-STX Math Channels



Note: *Math* comes up in the *Main* Menu if you scrolled to a math channel while vessel monitoring. If the channel is a vessel monitoring channel, the menu tree shows *Cal* in place of *Math*.

Figure 9-1. Math Channel Menu Tree

Introduction

The *Math* Menu is used to perform math calculations on the results from the channels associated with vessel monitoring. The calculated value can be displayed on the MVS while monitoring a math channel, in both Auto and Manual Modes. And, just like for a vessel monitoring channel, the calculated value from a math channel can have setpoints and current outputs associated with it.

As shown in Figure 9-1, the *Math* Menu includes 12 math functions. These functions can be used to process the vessel monitoring results in many ways. A few typical uses of the math channels follow:

- Add together or calculate the average for the weight from multiple vessels to provide information on the total inventory of a product stored in several vessels
- Convert the data into another set of units, such as converting a weight in pounds into a level in feet, to provide additional information on the vessel contents

When in the *Math* Menu, the display shows the math equation on the top line and the available functions on the bottom line.

All channels not used by a signal processor PCB or a slave device are available for math calculations. For example, for an MVS serially connected to eight STXs and with no other signal processor PCBs or slave devices, channels 1 through 8 are signal processor channels and channels 9 through 120 are available for math calculations.

This chapter covers the use of the *Math* Menu. The chapter includes:

- Explanation of each of the math functions and the keyboard functions
- Rules for inputting equations
- Detailed navigation procedures for enabling a math channel
- Detailed navigation procedures for setting up a math channel, using an example average weight calculation
- Explanation of compile error and run time error codes

Math Channel Functions

Menu Functions

C Identifies a specific channel in the equation. C must be immediately followed by a channel number (for example, C9 indicates the channel with factory-set ID# 9). All equations must start with the current channel designation and an equal sign (for example, *C9*= must be the start of the equation when you are in channel 9). When a channel number appears to the right of the equal sign, it tells the MVS to put the value from that channel (the weight from a vessel monitoring channel or the calculated value from a math channel) in the equation.

\+ Addition function. Adds the value to the right of the sign to the value to the left of the sign.

* Multiplication function. Multiplies the value to the right of the sign by the value to the left of the sign.

\- Subtraction function. Subtracts the value to the right of the sign from the value to the left of the sign.

÷ Division function. Divides the value to the left of the sign by the value to the right of the sign.

= Equals function. Places the value from the entire equation to the right of the sign in the channel designated to the left of the sign. All equations must start with the current channel designation and an equal sign (for example, *C9*= must be the start of the equation when you are in channel 9).

(Left parenthesis function. Used with right parenthesis to group math functions together.

) Right parenthesis function. Used with left parenthesis to group math functions together.

CLR Clear function. Clears the entire displayed formula from memory.

√ Square root function. Takes the square root of the value to the right of the sign.

ln Natural log function. Takes the natural log of the value to the right of the function.

e^ Inverse natural log. Takes the inverse natural log of the value to the right of the function.

Keyboard Functions

Up Arrow Scrolls to the left through the equation (MVS can only display 16 characters in the equation at a time, and the scroll function allows you to view equations that have more than 16 characters).

Down Arrow Scrolls to the right through the equation.

⇦ Deletes the character to the left of the cursor.

Enter Stores the current formula in memory.

Equation Limitations

Following are the limitations on the equations put into the math channels:

- A single equation can be up to 40 characters in length. A character is a number, a decimal point, or a function from the *Math* Menu. The example equation below contains 9 characters:
  C9=C1+10.
- A single equation can contain a maximum of 3 constants (a constant is a numerical value, such as 1000).
- A constant can have a maximum of 11 characters.
- Equations cannot contain any spaces between characters. The example below shows an incorrect and a correct equation:
  Incorrect (contains spaces)
  C9 = C3 + C4 + C6
  Correct (no spaces)
  C9=C3+C4+C6

- The MVS interprets equations using standard math rules regarding order of operations. If you are unsure of how to apply these rules, use parentheses to ensure that the MVS is calculating what you want it to calculate.
- The maximum value that a math channel can display is limited to six active digits; if the calculated value exceeds this maximum, an error message will appear when monitoring the channel. To prevent this error, scale down the value from the equation using the divide function. Note that the magnitude of the maximum value is dependent on the *Form* selected for the channel (see Chapter 5, MVS-STX Display Menu, for selecting the *Form*).

Equations containing more than 40 characters or more than three constants can be created by putting additional math channels on-line. These additional channels can be used to calculate intermediate results used by the math channel. The channels used to calculate the intermediate results can be hidden from the display by using the *Hide* function in the *Disp* Menu. The example below shows an incorrect equation with more than three constants and the use of multiple math channels to create a correct equation.

Incorrect (contains more than 3 constants)
C9=10*C3+100*C2+1000*C4+10000*C1
Correct
C10=10*C3 (hide this channel)
C9=C10+100*C2+1000*C4+10000*C1

Enabling a Math Channel

Note

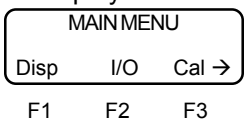
Refer to *RScn* in Chapter 8, MVS-STX Service Menu, for an explanation of the use of the Rescan function.

1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.

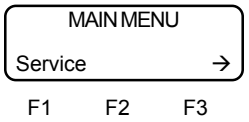
Note

It does not matter what channel the Manual Mode is in when you go into the menu tree to enable channels.

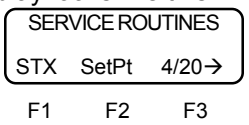
2. Press the Menu Key to display the *Main* Menu. The display shows:



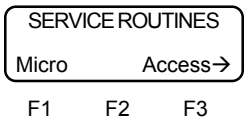
3. Press the Menu Key again to show the menu's second page. The display shows:



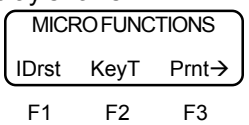
4. Press the F1 Key to access *Service*. The display looks like this:



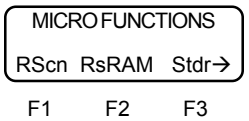
5. Press the Menu Key to access the menu's second page. The display shows:



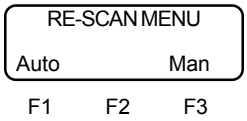
6. Press the F1 Key to access *Micro*. The display shows:



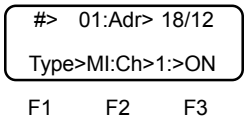
7. Press the Menu Key to access the menu's second page. The display shows:



8. Press the F1 Key to access *RScn*. The display shows:

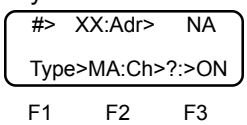


9. Press the F3 Key to access *Man*. The display looks like this:



10. The cursor is flashing to the left of the MVS channel number.
    A. Press the Arrow Keys to scroll to the desired channel number for the math channel.
    B. When you get to the channel you want to designate as a math channel, press the F2 Key to move the cursor to the *Type* field.
    C. Press the Arrow Keys until the *Type* is *MA*.
    D. Press the F3 Key to move the cursor to the *ON/OF* field.
    E. Press an Arrow Key to turn the channel *ON*.

    The display now looks like this:



    'XX' is replaced by the channel number you selected for the math channel.
11. To enable additional math channels:
    A. Press the F1 Key to move the cursor to the left of the MVS channel number.
    B. Repeat Step 10.
12. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

Note

The math channel(s) is now enabled, but you are still in the menu tree for another channel. Switch channels while channel monitoring in Manual Mode to access the math channel to set it up or view a previously entered equation.

Setting up a Math Channel

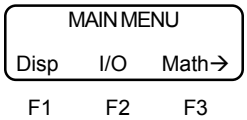
Note

You must enable the math channel, as described above, before you set it up.

The example below shows how to set up the math channel to calculate the average of the weights from four vessels. The equation used in the example is:

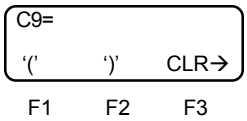
$$C9=(C1+C2+C3+C4)\div 4.0$$

1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired math channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:

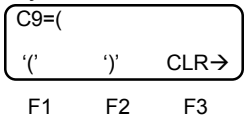


4. Press the F3 Key to access the *Math* Menu. The display shows:

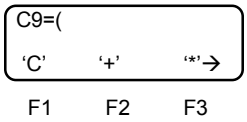
5. Press the Menu Key two times to access the menu's third page. The display shows:



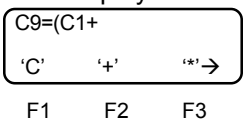
6. Press the F1 Key to select (. The display shows:



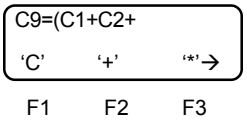
7. Press the Menu Key two times to access the menu's first page again. The display shows:



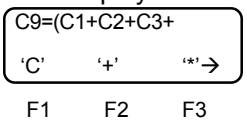
8. Press the F1 Key to select C. Press 1 on the keypad. Press the F2 Key to select +. The display shows:



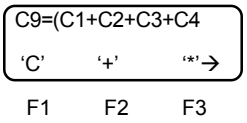
9. Press the F1 Key to select C. Press 2 on the keypad. Press the F2 Key to select +. The display shows:



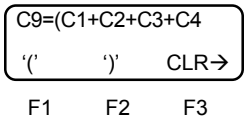
10. Press the F1 Key to select C. Press 3 on the keypad. Press the F2 Key to select +. The display shows:



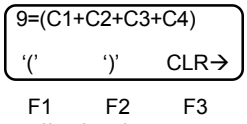
11. Press the F1 Key to select C. Press 4 on the keypad. The display shows:



12. Press the Menu Key two times to access the menu's third page. The display shows:

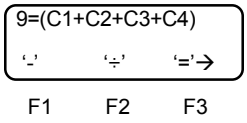


13. Press the F2 Key to select). The display shows:

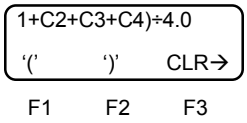


Notice the display has started to scroll — the C on the far left is not visible because of space limitations.

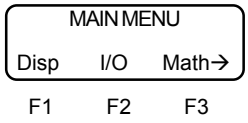
14. Press the Menu Key three times to access the menu's second page. The display shows:



15. Press the F2 Key to select ÷. Press 4.0 on the keypad. The display shows:



16. The entire equation is now input. Use the Arrow Keys to scroll through the equation to ensure it is entered correctly. Use the ⇦ Key to back up the cursor to correct entries. After you have checked the equation, press the Enter Key to save it in memory. If the equation does not have any compile errors, the display flashes a message acknowledging *Script Compile Successful* and returns to:



17. Press the Esc Key to scroll up the menu tree or press the Auto/Man Key to return to channel monitoring.

Channel 9 will now display the average of the weights in vessels 1 through 4. You can assign setpoints and current outputs for Channel 9 in the same manner as for a vessel monitoring channel.

Error Messages

If you make an error inputting an equation in a math channel, the MVS responds in one of two ways:

- After you input the equation and press the Enter Key, the MVS is not able to compile the equation and responds with a compile error code.
- After you input the equation and press the Enter Key, the MVS responds with *Script Compile Successful*. However, when you switch to channel monitoring for the math channel, the MVS is not able to perform the calculation and responds with a run time error code.

Listed below are the compile error codes and the run time error codes.

Compile Error Codes

A brief explanation is provided of the possible cause for each error code. Suggestions for correcting the error are included where applicable.

1 — Equal sign not found after math channel number.

2 — Equation exceeds maximum number of characters allowed (40).
Solution: Simplify equation or break it up into multiple equations, using multiple math channels.

3 — Equation exceeds maximum number of constants allowed (3) **OR** a constant includes more than the maximum number of characters allowed (11).
Solution: Simplify equation or break it up into multiple equations, using multiple math channels.

4 — Incorrect channel ID assigned to this channel (e.g., the equation says C9=, but you are in channel 10).

5 — Object buffer pointer exceeds maximum limit.
Solution: Simplify equation or break it up into multiple equations, using multiple math channels.

6 — Parenthesis mismatch (i.e., the number of left and right parentheses are not equal).

7 — All data registers are used up, insufficient memory is available for this channel.
Solution: Simplify equation or break it up into multiple equations, using multiple math channels.

8 — Equation includes spaces between characters.

9 — Equation tries to take a square root of a negative number (e.g, square root of -4).

10 — Equal sign in incorrect place (e.g., C9=C2+C3=C4).

11 — Equation includes an illegal character, such as a '.' or a '+', at the end (e.g., C9=C2+2. is illegal but C9=C2+2.0 or C9=C2+2 are allowable).

12 — Incorrect, duplicated character (e.g., C9=CC2+2).

13 — Incorrect use of an operator (e.g., C9=C2+*2).

14 — Operator missing (e.g., C9=C2C2).

Run Time Error Codes

A brief explanation is provided of the possible cause for each error code; suggestions for correcting the error are included where applicable.

1 — Equation tries to divide by zero.

2 — Equation tries to take a square root of a negative number that is calculated as part of the equation (i.e., square root of (8-12)).

3 — Equation tries to take a natural log (ln) of a negative number or of 0.

4 — Result from intermediate channel being input into this channel is too large.
Solution: Correct and/or scale the equation for the intermediate channel.

5 — Result is too large to display.
Solution: Modify the *Form* for the math channel (see Chapter 5, MVS-STX Display Menu) and/or scale the result by using the divide function.

Appendix A. Product Specifications

Analog Input

Resolution. Selectable 16 bit (1 part in 65,536) to 21 bit (1 part in 2,097,152)
Conversion Speed. 20 mSec at 16 bits, 125 mSec at 19 bits, 512 mSec at 21 bit
Span. Programmable between 19.5 mV and 2.5 V
Temperature Stability. Zero 1 ppm/°C; Span 5 ppm/°C
Common Mode Rejection. 92 db minimum at DC; 150 db minimum at 60 Hz
Normal Mode Rejection. 100 db minimum at 60 Hz
Programmable Filter Range. 1.95 Hz to 205.5 Hz

Serial Communications Port

Hardware Standard. RS-422 or RS-485
Baud Rate. 1200, 2400, 4800, 9600, or 19200

Optional Analog Output

Format. 0-20 or 4-20 mA
Resolution. 14 bit (1 part in 16,384)
Isolation. 500 VAC
Maximum Load. 600 ohms with internal loop supply; up to 2400 ohms with external loop supply

Excitation Output

Programmable between 5 and 13 volts at 114 mA

Power Requirements (sensors not included)

DC Power (standard). 14.4 Vdc to 30.0 Vdc at 80 mA (225 mA with 0-20/4-20 current output option)
AC Power (optional). 87-110 Vac, 15 Watts maximum, 50/60 Hz;
105-132 Vac, 15 Watts maximum, 50/60 Hz;
192-242 Vac, 15 Watts maximum, 50/60 Hz

Environmental

Operating Temperature. Card Set (no power supply): 14° to 158° F (-10° to 70° C)
With Power Supply: 14° to 122° F (-10° to 50° C)
Storage Temperature. -40° to 158° F (-40° to 70° C)
Humidity. 1% to 95% (non-condensing)

Optional Enclosures

Fiberglass. NEMA 4X, IP66
Stainless Steel. NEMA 4X, IP66

Appendix B. Serial Commands

Introduction

This appendix contains the serial commands and protocol syntax used for serial communications between the host or Master (ROPE, PC, etc.) and the STX. Detailed explanations and examples of the commands are included.

Note

You must calibrate the STX digitally if the STX is serially connected to another device, even if you have already done an analog calibration.

Command Table

Command		Function	Transmitted by Master to STX [1]	Received by Master from STX [1]
Hex	ASCII			
23	#	K-M product identification number	>aa#ssr	Addssr (A3568r for STX)
57	W	Request engineering units (gross wt)	>aaWssr	A±ddddddssr
42	B	Request engineering units (net wt)	>aaBssr	A±ddddddssr
54	T	Tare addressed vessel	>aaTssr	Ar
6D,37	m7	Select self-calibration mode *Note*: d indicates mode 0=disable periodic self-calibration, 1=enable periodic self-calibration	>aam7000000dssr	Ar
75,31	u1	Request raw counts	>aau1ssr	Addddddddssr
6D,31	m1	Select analog or digital mode *Note*: d indicates mode 0=analog, 1=digital	>aam1000000dssr	Ar
4C	L	Auto lo span calibration	>aaLddddddddssr	Adssr [2]
48	H	Auto hi span calibration	>aaHddddddddssr	Adssr [2]
5A	Z	Auto zero calibration	>aaZddddddddssr	Adssr [3]

Notes:

[1] See Table B-2 for definitions of the characters in the command strings.

[2] d is the return status code:
0 = Calibration successful
1 = “Ambiguous” warning. Hi Span counts are greater than Lo Span counts.
2 = “Move more material” warning. Change in weight caused a change of less than 20,000 counts.
Note that the Hi Span or Lo Span value is still entered when the warning (d=1 or 2) is given.

[3] d is the return status code:
0 = Calibration successful

Table B-1. STX Serial Commands

Character	Definition
>	Start of message character
aa	Two-digit ASCII HEX character address of channel
d	One-digit ASCII decimal number data
dd	Two-digit ASCII decimal number data
dd..	Two-digit or more ASCII decimal number data
dd..dd	Multiple ASCII decimal numbers
hh	Two-digit ASCII HEX number, upper nibble, lower nibble
hh..hh	Multiple two-digit ASCII HEX numbers
ss	Two-digit ASCII HEX checksum of characters added between '>' or 'A' and checksum characters. See *Checksum Calculation* in this appendix for an explanation of how checksum is calculated. Note that the '?' character in place of the checksum characters is a wildcard and therefore ignores the checksum.
r	Carriage return (0x0D)
A	Acknowledge character (0x41)
N	Not acknowledge character (0x4E)
±	Normally indicates polarity. If an error is present, an 'X' displays with an error code (ASCII character) immediately following. Possible error codes and definitions are listed below: 1 — Unit disabled 6 — ADC overrange error 7 — Net or gross engineering unit overflow

Table B-2. Definitions of Characters in Command Strings

Checksum Calculation

The one-byte checksum is calculated by adding the Hex values of all ASCII characters between the start of message character '>' or acknowledge character 'A' and the checksum character 'ss.' Overflows from the addition are ignored.

Example:

Request

To request gross engineering units (such as weight) from an STX, the command is:

>aaWssr

If the STX's address is '3', the command is:

>03Wssr

Calculating the checksum 'ss' as the sum of the Hex values of all characters between '>' and'ss':

03W ASCII = 30 Hex + 33 Hex + 57 hex = BA Hex
'0' '3' 'W'

Therefore, the ASCII string transmitted to the STX is:

>	0	3	W	B	A	CR	
3E	30	33	57	42	41	0D	Hex

Response

The response to a request for gross engineering units is:

A±ddddddssr

If the weight is +6384, the response is:

A+0006384ssr

Calculating the checksum 'ss' as the sum of the Hex values of all characters between 'A' and 'ss':

+0006384 ASCII = 2B Hex+30 Hex+30 Hex+30 Hex+36 Hex+33 Hex+38 Hex+34 Hex = 190 Hex
'+' '0' '0' '0' '6' '3' '8' '4'

Ignoring the overflow, the checksum is 90 Hex. Therefore, the ASCII string transmitted back to the master is:

A	+	0	0	0	6	3	8	4	9	0	CR	
41	2B	30	30	30	36	33	38	34	39	30	0D	Hex

Examples

For each command below, the general format of the command is shown above the example.

'#' Command — K-M Product Identification Number

This command is sent by the master to request the STX to send its K-M product identification code (code is 35 for the STX). For this example, the master requests the code from an STX at address 01, which returns a code of 35 and a checksum of 68.

Request from Master	**Response from STX**	
>aa#ssr	Addssr	*Format*
>01#84r	A3568r	*Example*

'W' Command — Engineering Units (gross)

This command is sent by the master to request the STX to send the gross engineering units (weight, level, etc.). For this example, the master requests the gross weight from an STX at address 01, which returns a gross weight of +7103 and a checksum of 86.

Request from Master	**Response from STX**	
>aaWssr	A±ddddddssr	*Format*
>01WB8r	A+000710386r	*Example*

'B' Command — Engineering Units (net)

This command is sent by the master to request the STX to send the net engineering units (weight, level, etc). For this example, the master requests the net weight from an STX at address 01, which returns a net weight of -4466 and a checksum of 91.

Request from Master	**Response from STX**	
>aaBssr	A±ddddddssr	*Format*
>01BA3r	A-000446691r	*Example*

'T' Command — Tare Addressed Vessel

This command is sent by the master to request the STX to tare the channel. For this example, the master requests the tare for an STX at address 01.

Request from Master	**Response from STX**	
>aaTssr	Ar	*Format*
>01TB5r	Ar	*Example*

‘m7’ Command — Select Self-Calibration Mode

This command is sent by the master to request the STX to set the periodic self-calibration mode for the channel. It may be necessary to disable the self-calibration when performing a tare, to prevent it from interfering with batching operations. For this example, the master disables the self-calibration for an STX at address 01.

Request from Master	Response from STX	
>aam7000000dssr	Ar	*Format*
>01m7000000055r	Ar	*Example*

Note: d = 0 = disable periodic self-calibration, d = 1 = enable periodic self-calibration

‘u1’ Command — Request Raw Counts

This command is sent by the master to request the STX to send the raw counts. For this example, the master requests the raw counts from an STX at address 01, which returns a raw count of 1147226 and a checksum of 67.

Request from Master	Response from STX	
>aau1ssr	Adddddddssr	*Format*
>01u107r	A114722667r	*Example*

‘m1’ Command — Select Analog or Digital Mode

This command is sent by the master to request the STX to select analog or digital mode for the channel. For this example, the master sets the mode to analog for an STX at address 01.

Request from Master	Response from STX	
>aam1000000dssr	Ar	*Format*
>01m100000004Fr	Ar	*Example*

Note: d = 0 = analog mode, d = 1 = digital mode

Note

The remaining commands deal with performing an Auto Calibration. Refer to the *Auto* section in Chapter 7, MVS-STX Calibration Menu, for a description of the calibration functions and methods.

'L' Command — Auto Lo Span Calibration

This command is sent by the master to request the STX to set Lo Span for the channel. For this example, the master sets the Lo Span to 25,000 lbs for an STX at address 01. The STX returns a status code of 0 (calibration successful) and a checksum of 30.

Request from Master	**Response from STX**	
>aaLddddddssr	Adssr	*Format*
>01L002500004r	A030r	*Example*

Note: In response from STX:
d = 0 = calibration successful
d = 1 = "Ambiguous" warning. Hi span counts are greater than lo span counts.
d = 2 = "Move more material" warning. Change in weight caused a change of less than 20,000 counts.

'H' Command — Auto Hi Span Calibration

This command is sent by the master to request the STX to set Hi Span for the channel. For this example, the master sets the Hi Span to 50,000 lbs for an STX at address 01. The STX returns a status code of 0 (calibration successful) and a checksum of 30.

Request from Master	**Response from STX**	
>aaHddddddssr	Adssr	*Format*
>01H0050000FEr	A030r	*Example*

Note: In response from STX:
d = 0 = calibration successful
d = 1 = "Ambiguous" warning. Hi Span counts are greater than Lo Span counts.
d = 2 = "Move more material" warning. Change in weight caused a change of less than 20,000 counts.

'Z' Command — Auto Zero Calibration

This command is sent by the master to request the STX to set Zero for the channel. For this example, the master sets the Zero Calibration point to 0 lbs for an STX at address 01. The STX returns a status code of 0 (calibration successful) and a checksum of 30.

Request from Master	**Response from STX**	
>aaZddddddssr	Adssr	*Format*
>01Z00000000Br	A030r	*Example*

Note: In response from STX: d = 0 = calibration successful

Appendix C. MVS-STX Calculation of Manual Calibration Parameters

Introduction

For manual calibration, you calculate and directly input the scale factor weight and counts. There are three reasons for performing a manual calibration instead of an automatic (live load) calibration:

1. Pre-Calibration — You just installed your system, cannot move any material now, and want to get started using your system with a 'pre-calibration.'
2. Refining the Calibration — After calibration, you kept an accurate record of actual material weight and indicated material weight. You want to use this information now to 'refine' the calibration.
3. Re-entering Calibration Data — You want to re-enter data from a previous calibration that provided better accuracy than the current calibration.

This Appendix explains and provides examples of the calculation of *Manual* calibration parameters for items 1 and 2 above. Follow the procedures in Chapter 7, MVS-STX Calibration Menu, to input the parameters.

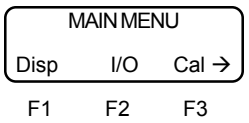
Pre-Calibration

You just installed your system, cannot move any material now, and want to get started using your system with a pre-calibration. Pre-calibration values are based on system parameters, such as sensor sensitivity, rated load, live load stress, current live load, and A/D converter sensitivity.

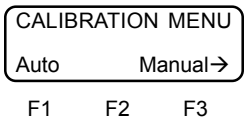
Note that a pre-calibration does not take into account the *actual* structural response to changes in load. We theoretically expect a change in load to result in a proportional change in digital counts, but the structure's actual response to load and interaction with piping, catwalks, a roof, discharge chutes, etc. prevents the system from achieving the theoretically expected values. Additionally, the pre-calibration could be inaccurate if your estimate of the current material weight is off. When scheduling permits you to move material into or out of the vessel, perform a live load calibration (*Auto Cal*) to obtain the highest accuracy.

Follow this procedure to obtain the MVS's A/D converter sensitivity (needed to calculate the manual calibration parameters):

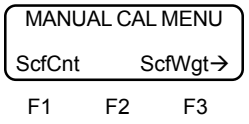
1. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
2. Use the Arrow Keys to scroll to the desired channel.
3. Press the Menu Key to display the *Main* Menu. The display shows:



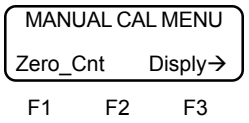
4. Press the F3 Key to access the *Cal* Menu. The display shows:



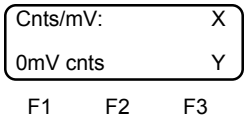
5. Press the F3 Key to access the *Manual* Menu. The display shows:



6. Press the Menu Key to access the menu's second page. The display shows:



7. Press the F3 Key to access *Disply*. The display looks like this:



Record the *Cnts/mV*.

Calculation of the pre-calibration parameters is also dependent on sensor type. Procedures are given below for:

- Bolt-on sensors (L-Cells and Microcells)
- Direct Support Sensors (Load Stands, Load Discs, and Load Links)

Bolt-On Sensors

Note

In this procedure, use the value for *Cnts/mV* from the MVS.

Calculate the pre-calibration parameters:

1. From the sensor manual/data sheet, record the sensor sensitivity (S). The sensor sensitivity has units of mV/psi or mV/kg/mm^2.
2. Refer to the Application Data Form for the vessel (if you cannot locate the completed form, contact K-M for a copy). Record the vessel working capacity and the corresponding stress.
3. Record the current live load in the vessel (lbs or kg).
4. Calculate the calibration values:
   ScfWgt = working capacity (lbs or kg)
   ScfCnt = S x *Cnts/mV* x Stress (psi or kg/mm^2)
   Zero_Cal = current live load (lbs or kg)

Note

ScfWgt and *ScfCnt* are input in the *Manual* Menu, while *Zero_Cal* is input in the *Auto* Menu.

Example: You are using L-Cells to monitor a vessel. The vessel currently has 50,000 lbs of material in it. You go to the *Disply* submenu in the *Manual* calibration menu and write down the *Cnts/mV* — 699.05. Following the pre-calibration procedure:

1. S = 35 mV/1000 psi (from L-Cell manual)
2. From the Application Data Form, the working capacity is 200,000 lbs and the corresponding stress is 1892 psi.
3. Current live load = 50,000 lbs
4. Calculate the calibration values:
   ScfWgt = working capacity (lbs) = 200,000 lbs
   ScfCnt = S x *Cnts/mV* x Stress (psi)
   = 35 mV/1000 psi x 699.05 Cnts/mV x 1892 psi
   = .035 mV/psi x 699.05 Cnts/mV x 1892 psi
   = 46,291 Counts
   Zero_Cal = current live load (lbs) = 50,000 lbs

Direct Support Sensors

Note

In this procedure, use the value for *Cnts/mV* from the MVS.

Calculate the pre-calibration parameters:

1. From the sensor label or manual, record the Rated Load for one sensor.
2. From the sensor label or manual, record the sensor sensitivity (S). The sensitivity has units of mV/V. Calculate and record the average sensitivity if the system has multiple sensors with slightly different sensitivities.
3. Record the excitation voltage for the system. Typical excitation values:
   - K-M silicon sensors — 12 Volts
   - Foil gage sensors — 10 Volts
4. Record the current live load in the vessel.
5. Calculate the calibration values:
   ScfWgt = Rated Load (lbs or kg) x Number of Supports
   ScfCnt = S (mV/V) x Excitation Voltage (V) x Cnts/mV
   Zero_Cal = current live load (lbs or kg)

Note

ScfWgt and *ScfCnt* are input in the *Manual* Menu, while *Zero_Cal* is input in the *Auto* Menu.

Example: You are using load cells to monitor a vessel with four legs. The sensors have a sensitivity of 30mV/V and a rated load of 100,000 lbs. The vessel is empty (contains 0 lbs of material). You go to the *Disply* submenu in the *Manual* calibration menu and write down the *Cnts/mV* — 699.05. Following the pre-calibration procedure:

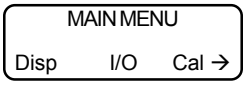
1. Rated Load for one sensor = 100,000 lbs
2. S = 30 mV/V
3. Excitation Voltage = 12 V
4. Current live load = 0 lbs
5. Calculate the pre-calibration values:
   ScfWgt = Rated Load (lbs) x number of supports
   = 100,000 lbs x 4 = 400,000 lbs
   ScfCnt = S x Excitation Voltage x Counts/mV
   = 30 mV/V x 12 V x 699.05 Cnts/mV
   = 251,658 Cnts
   Zero_Cal = current Live Load = 0 lbs

Refining the Calibration

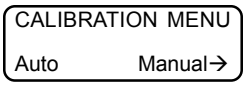
While moving material into the vessel, you kept an accurate record of the actual material weight and the indicated material weight (from the MVS). Now you want to use this information to refine the calibration.

Follow this procedure to refine the calibration:

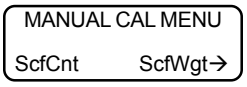
1. Define the recorded material weights as Indicated High Weight, Indicated Low Weight, Actual High Weight, and Actual Low Weight (Actual Low Weight is 0, because you started with an empty vessel). Calculate the change in indicated and actual weight:
   IW = Change in Indicated Weight =
   Indicated High Weight - Indicated Low Weight
   AW = Change in Actual Weight =
   Actual High Weight - Actual Low Weight
2. If in Auto Mode (Auto LED illuminated), press the Auto/Man Key to put the MVS in Manual Mode. The Auto LED turns off.
3. Use the Arrow Keys to scroll to the desired channel.
4. Press the Menu Key to display the *Main* Menu. The display shows:

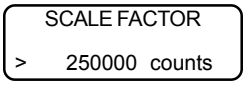
5. Press the F3 Key to access the *Cal* Menu. The display shows:

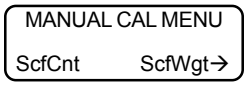
6. Press the F3 Key to access the *Manual* Menu. The display shows:

7. Press the F1 Key to access *ScfCnt*. The display looks like this:

8. Calculate the Corrected *ScfCnt*:
   = Old *ScfCnt* x (IW ÷ AW)
9. Input the corrected *ScfCnt*. Press the Enter Key. The display acknowledges the entry and returns to:

10. Enter the current live load weight as *Zero_Cal*. See *Refining the Calibration by Setting Zero* in Chapter 7, MVS-STX Calibration Menu, for details on navigating to the *Zero_Cal* Menu.

Example: When the vessel was empty, the display indicated 500 lbs. You added 9,000 lbs of material, and noted the display indicated 10,000 lbs in the vessel. You want to refine the calibration. You go to the *ScfCnt* submenu in the *Manual* calibration menu and write down the existing scale factor counts. Summarizing the data below:

Indicated High Weight = 10,000 lbs
Indicated Low Weight = 500 lbs
Actual High Weight = 9,000 lbs
Actual Low Weight = 0 lbs
SCF_CNT = 250,000

Calculate the change in indicated and actual weight
IW = Change in Indicated Weight =
Indicated High Weight - Indicated Low Weight =
10,000 lbs - 500 lbs = 9,500 lbs
AW = Change in Actual Weight =
Actual High Weight - Actual Low Weight =
9,000 lbs - 0 lbs = 9,000 lbs

Calculate the corrected *ScfCnt:*
Corrected *ScfCnt* = Old *ScfCnt* x (IW ÷ AW)
= 250,000 counts x (9,500 lbs ÷ 9,000 lbs)
=263,889 counts

Zero_Cal = current live load = 9,000 lbs

Appendix D. MVS-STX Error Messages

This Appendix contains descriptions of the error messages displayed by the MVS-STX:

1. Signal Processor Not Available
2. Overrange Error
3. COM Error Adr:XX
4. STX Error Adr:XX
5. I/O Error Adr:XX
6. Warning: Ambiguous Error .. Lo Span Will Be Entered .. Need New Hi Span
7. Warning: Ambiguous Error .. Hi Span Will Be Entered .. Need New Lo Span
8. Warning: Add Or Subtract More Material
9. Signal Processor All Hidden
10. Units Overrange
11. Math Channel Overrange ChXX
12. Math Channel Units Over ChXX
13. Math Error # or Script Compile Error #

For each error message, one or more possible explanations and suggested solutions are provided.

1. Signal Processor Not Available

Explanation

There are no internal signal processor PCBs and/or external signal processors active or enabled in the system.

Solutions

A. If an STX PCB(s) is installed in the MVS:
   1. The MVS may not recognize the STX PCB. Rescan the MVS using the *Service/Micro/RScn/Auto/i2c_IO* Menu. See Chapter 8, MVS-STX Service Menu.
   2. All channels may be disabled. Display selected disabled channels again by turning *Enabe* on, using the *Service/STX/Enabe* Menu. See Chapter 8, MVS-STX Service Menu.
   3. The STX PCB may not be installed properly. Ensure the PCB is inserted into the card guides and is mated fully with the backplane connector.
   4. The STX PCB may be malfunctioning. Replace the STX PCB. Restore the STX PCB parameters using the *Service/STX/Rtor/STX* Menu. See Chapter 8, MVS-STX Service Menu.

B. If an external STX(s) is communicating serially with the MVS:
   1. The external STX may not be correctly wired to COM1. Ensure the external STX is correctly wired to COM1.
   2. COM1 may not be set to *Master*. Ensure COM1 is set to *Master* in the *I/O/Serl/MVS/COM1/Mode* Menu. See Chapter 6, MVS-STX Inputs and Outputs Menu.
   3. The rocker arms on the S1 switch on the STX PCB, which assign the serial address, may not be set properly. Check the rocker arm settings, referring to Table 2-1 in Chapter 2, Hardware Installation.
   4. The microprocessor PCB in the MVS may not be installed properly. Ensure the PCB is inserted into the card guides and is mated fully with the backplane.
   5. The MVS may not recognize the external STX(s). Rescan the MVS using the *Service/Micro/RScn/Auto/All* Menu. See Chapter 8, MVS-STX Service Menu.
   6. The MVS microprocessor PCB may be malfunctioning. Replace the microprocessor PCB. Restore the microprocessor PCB parameters using the *Service/STX/Rtor/Micro* Menu. See Chapter 8, MVS-STX Service Menu.

Note

If you have multiple signal processor PCBs, access *Service/STX/Rtor/Micro* from **each** STX PCB to restore the parameters from each PCB.

2. Overrange Error

Explanation

Sensor input is causing the counts to go above 2,097,151 (if +) or to 0 (if -) because one of the legs of the excitation voltage is not functioning.

Solutions

A. If using K-M half-bridge sensors, ensure jumpers JP8 and JP10 on the STX PCB are on the Half pins. See Appendix H, Technical Drawings.

B. Check wiring of the sensor to the junction box and junction box to the STX PCB or Termination PCB. Correct loose, damaged (shorted), or incorrect wiring.
C. One or more sensors may be damaged. Follow troubleshooting procedures detailed in the sensor manual to locate the damaged sensor. Replace if required.
D. Check the power supply by measuring across the +Ex and -Ex on the STX PCB or Termination PCB:
   - If using K-M half-bridge sensors, verify the voltage is approximately 12 Volts.
   - If using foil-gage sensors, verify the voltage meets the sensor manufacturer's requirements.

   If the voltage is incorrect, adjust *AdjEx* (*Service/STX/AdjEx*) until the correct voltage is measured. See Chapter 8, MVS-STX Service Menu. If you cannot obtain the correct voltage, replace the power supply.
E. Measure the voltage across the In+ and In- terminals on the STX PCB or Termination PCB. This is the actual signal coming back from the sensor. For K-M half-bridge sensors, the reading should be less than 1 Volt.
   - If the reading is less than 1 Volt, check *Gain* (*Service/STX/Gain*). If *Gain* is set correctly, the A/D converter is probably damaged. Consult with K-M.
   - If the reading is greater than 1 volt, recheck wiring, sensors, and power supply as described in Steps A through D.

3. COM Error Adr:XX

Explanation

An external STX PCB at hexadecimal address 'XX' has stopped responding to the MVS's microprocessor PCB.

In addition to the error message, this condition is also indicated by the LEDs on the microprocessor PCB in the MVS. When serial communications are functioning normally, the top two LED indicators flash. If only the lower of the top two LEDs is flashing, the microprocessor PCB is attempting communications with no response from the external STX.

Solutions

A. Ensure power is applied to the external STX.
B. Check the hard-wired connections between the MVS and external STX. Correct loose, damaged (shorted), or incorrect wiring.
C. The rocker arms on the S1 switch on the STX PCB, which assign the serial address, may not be set properly. Check the rocker arm settings, referring to Table 2-1 in Chapter 2, Hardware Installation.
D. The serial parameters of the MVS and the external STX may not match. Ensure parameters match, referring to *Serl* in Chapter 6, MVS-STX Inputs and Outputs Menu, and to the *MVS Installation and Operation Manual*.

4. STX Error Adr:XX

Explanation

An STX PCB installed in the MVS at hexadecimal address 'XX' has stopped responding to the MVS's microprocessor PCB.

The hexadecimal address for an internal PCB consists of two digits. The first digit indicates the rack (1=1st rack, 2=2nd rack, etc.). The second digit indicates the position in the rack, with '1' being the left-most position. For example, an address of '12' indicates the STX PCB is in the first rack and is in the second position from the left in the rack.

Solutions

A. The MVS may not recognize the STX PCB. Rescan the MVS using the *Service/Micro/RScn/Auto/i2c_IO* Menu. See Chapter 8, MVS-STX Service Menu.
B. All channels may be disabled. Display selected disabled channels again by turning *Enabe* on, using the *Service/STX/Enabe* Menu. See Chapter 8, MVS-STX Service Menu.
C. The STX PCB may not be installed properly. Ensure the PCB is inserted into the card guides and is mated fully with the backplane connector.
D. The STX PCB may be malfunctioning. Replace the STX PCB. Restore the STX PCB parameters using the *Service/STX/Rtor/STX* Menu. See Chapter 8, MVS-STX Service Menu.

5. I/O Error Adr:XX

Explanation

An I/O PCB (for example, Relay Output PCB or Current Output PCB) at hexadecimal address 'XX' has stopped responding to the MVS's microprocessor PCB.

The hexadecimal address for an internal PCB consists of two digits. The first digit indicates the rack (1=1st rack, 2=2nd rack, etc.). The second digit indicates the position in the rack, with '1' being the left-most position. For example, an address of '12' indicates the I/O PCB is in the first rack and is in the second position from the left in the rack.

Solutions

A. The MVS may not recognize the I/O PCB. Rescan the MVS using the *Service/Micro/RScn/Auto/i2c_IO* Menu. See Chapter 8, MVS-STX Service Menu.
B. The I/O PCB may not be installed properly. Ensure the PCB is inserted into the card guides and is mated fully with the backplane connector.
C. The I/O PCB may be malfunctioning. Replace the I/O PCB.

Note

If you replace a Current Output PCB, you must reenter the *Mode* (0-20 mA or 4-20 mA, in the *I/O/Iout/Mode* Menu) and current output calibration values (in the *Service/4/20/Iadj* Menu).

6. Warning: Ambiguous Error .. Lo Span Will Be Entered .. Need New Hi Span

Explanation

While performing an Auto Calibration, you entered a Lo Span weight that is higher than the Hi Span weight **OR** the MVS-STX is calculating that the counts for the Lo Span are greater than the counts for the Hi Span.

Note

You may get this message if:
1. You are doing an initial calibration, because the MVS-STX is comparing the new Lo Span to the factory-default Hi Span, **OR**
2. You are recalibrating the MVS-STX, because the MVS-STX is comparing the new Lo Span to the old Hi Span.

Solutions

A. Verify you entered the correct Lo Span weight. Reenter if necessary.
B. Verify the correct amount of material was actually moved.
C. If the entered Lo Span is correct, follow the path *Cal/Auto/Disply* to check the Auto calibration values. You may have made an error in entering Hi Span. If you made an error, you must move material again to recalibrate or perform a manual calibration.

7. Warning: Ambiguous Error .. Hi Span Will Be Entered .. Need New Lo Span

Explanation

While performing an Auto Calibration, you entered a Hi Span weight that is lower than the Lo Span weight **OR** the MVS-STX is calculating that the counts for the Hi Span are less than the counts for the Lo Span.

Note

You may get this message if you are recalibrating the MVS-STX, because it is comparing the new Hi Span to the old Lo Span.

Solutions

A. Verify you entered the correct Hi Span weight. Reenter if necessary.
B. Verify the correct amount of material was actually moved.
C. If the entered Hi Span weight is correct, follow the path *Cal/Auto/Disply* to check the Auto calibration values. You may have made an error in entering the Lo Span weight. If you made an error, you must move material again to recalibrate or perform a manual calibration.

8. Warning: Add Or Subtract More Material . .

Explanation

While performing an Auto Calibration, you added or removed material from the vessel. The amount of material you moved produced a change of less than 20,000 counts. The MVS-STX will proceed and calibrate the system with the entered values. However, for good calibration accuracy, a larger change in counts/larger movement of material is recommended.

Solution

Verify the correct amount of material was actually moved. Recalibrate when possible with a larger movement of material.

9. Signal Processor All Hidden

Explanation

Vessel monitoring results are not shown on the display because all channels are hidden.

Solution

Display all hidden channels again by disabling *Hide*:

A. Put the MVS in Manual Mode.
B. Press the Shift Key (Shift LED illuminated) and then press the '9' Key.
C. The display acknowledges *Hide* is disabled.

10. Units Overrange

Explanation

The calculated gross or net weight exceeds six active digits (999999).

Solutions

Note

Write down all existing system parameters before you change *Form* or *Units*. If you change *Form* or *Units* you must adjust system parameters to correspond to the new *Form* or *Units*.

A. Check *Form*. A *Form* of xxx.xx yields a maximum value of 999.999, while a *Form* of xxxxx00 yields a maximum value of 99999900. Ensure *Form* is consistent with the maximum expected value.
B. Check *Units*. For example, a value in tons is 2000 times greater than a value in pounds; a value in barrels is 42 times greater than a value in gallons. Make sure that *Units* are consistent with the maximum expected value.
C. Check the calibration. Recalibrate if required.

11. Math Channel Overrange ChXX

Explanation

This applies to math channels only. It indicates one of the sensor input channels used in the math formula is above 2,097,151 counts (if +) or 0 (if -). There will be a corresponding Units Overrange error message on the sensor channel.

Solution

Determine which of the sensor input channels has the overrange problem by scrolling to each input channel to see if the Overrange Error message is displayed. Then, see Units Overrange above for correcting the problem.

12. Math Channel Units Over ChXX

Explanation

This applies to math channels only. It indicates the calculated net or gross weight from one or more of the sensor input channels used in the math formula exceeds six active digits (999999). There will be a corresponding Units Overrange error message on the sensor channel.

Solution

Determine which of the input channels has the problem by scrolling to each input channel to see which has the Units Overrange message displayed. Then, see Units Overrange above for correcting the problem.

13. Math Error # or Script Compile Error

Explanation

These apply to math channels only. They indicate a problem with the input equation.

Solution

See Chapter 9, MVS-STX Math Channels, for a detailed list of math error messages and solutions.

Appendix E. Trimming the Current Output

If the calibration of the device receiving the current output does not match the calibration of the Current Output PCB (soldered to the STX PCB), follow this procedure to 'trim' the STX's current output:

1. See Figure E-1 and TI-SP.STX-02 (stand-alone), TI-SP.STX-03 (standard 19" rack), or TI-MVS.STX-01 (MVS-STX) in Appendix H.
   - If a current monitoring device is connected to Iout, connect an ammeter in series with the device.
   - If a monitoring device is not being used, connect the ammeter positive (+) lead to +Iout. Connect the negative (-) lead to -Iout.
2. If the STX is off, apply power and let it warm up for at least 15 minutes.
3. Place the STX at the 20 mA calibration point by removing the jumper from JP3 Wdog and placing it on JP2 Factory. Verify there is a jumper on JP1 Aux.
4. Press and hold SW1 (Up) and/or SW2 (Down) until the ammeter shows 20 mA.
5. Press SW1 and SW2 simultaneously to place the STX at the 4 mA calibration point.
6. Press and hold SW2 (Down) until the ammeter shows 4 mA.
7. Press SW1 and SW2 simultaneously to place the STX at the 0 mA calibration point.
8. Press and hold SW2 (Down) until the ammeter shows 0 mA.
9. Remove the ammeter from TB11.
10. Remove the jumper from JP2 Factory and place it on JP3 Wdog, pins 1 and 2.

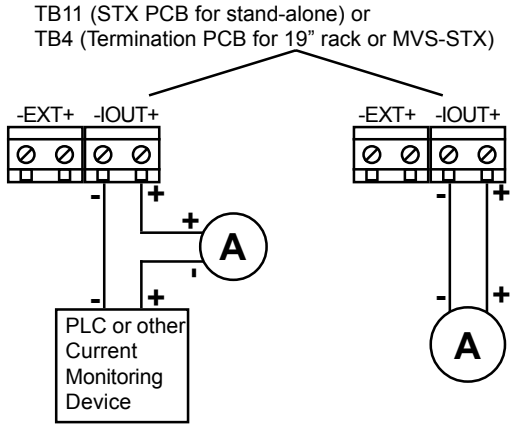


Figure E-1. Two Methods for Connecting Ammeter

Appendix F. Industry Approvals

This appendix contains the following industry approval(s).

- Manufacturer’s Declaration of Conformity

Kistler-Morse®

CE

Manufacturer's Declaration of Conformity

PRODUCT: STX - Signal Processor

MODELS:

STX-*-X-X-S	STX-*-C-X-7	STX-*-X-I-M
STX-*-X-X-7	STX-*-C-X-M	STX-*-C-I-S
STX-*-X-X-M	STX-*-X-I-S	STX-*-C-I-7
STX-*-C-X-S	STX-*-X-I-7	STX-*-C-I-M

* = M: Strain, N: 0-20/4-20 mA, P: 0-1/0.2-1 VDC, K: 0-5/1-5 VDC, L: 0-10/2-10 VDC

MANUFACTURER:	Name:	Kistler-Morse Corp.
	Address:	19021 120th Ave. NE Bothell, WA 98011
	Country:	USA
IMPORTER:	Name:	Paul Janssens, K-M Europe
	Address:	Rucaplein 531 B-2610 Antwerp
	Country:	Belgium

APPLICATION of COUNCIL DIRECTIVES: 73/23/EEC, 89/336/EEC

STANDARDS USED: EN55011-A, EN50082-2, EN61010-1

MEANS OF CONFORMITY:

The product is in conformity with Directive 89/336/EEC based on test results using harmonized standards in accordance with Article 10(1) of the Directive.

REPRESENTATIVE: Sesh Velamoor
FUNCTION: President
SIGNATURE: _____

Place: Bothell, WA USA
Date: 12-31-96

Appendix G. Kistler-Morse Service and Warranty

Product Warranty

A complete, unabridged copy of our product warranty is available upon request from Kistler-Morse. A summary of the warranty, *subject to the terms and conditions listed fully in the warranty*, follows:

> Kistler-Morse warrants equipment of its own manufacture to be free from defects in material and workmanship for one year from date of shipment to original user. Kistler-Morse will replace or repair, at our option, any part found to be defective. Buyer must return any part claimed defective to Kistler-Morse, transportation prepaid.

Service

K-M maintains a fully trained staff of field service personnel who are capable of providing you with complete product assistance. Our field service staff is based in Bothell, Washington USA (corporate headquarters) and Antwerp, Belgium (European office).

Phone Consultation

Our Field Service staff provides the following services by telephone, via our regular and toll free number (toll free number in USA and Canada only):

- Technical, application, and troubleshooting assistance
- Spare parts assistance
- Warranty (replacement) assistance

On-Site Consultation

K-M's Field Service staff can provide additional services at your request. Contact K-M at the closest office for rate and scheduling information for the following services:

- Technical, application, startup, and troubleshooting assistance on-site
- Training on-site or at our corporate office
- Service calls
- Equipment updates to our latest configuration

General descriptions of some of these standard services follow. Of course, if your service needs vary from those described, we are available to discuss them with you.

Installation, Startup Assistance, and On-Site Training

Note

1. For vessels to be instrumented with Microcells or L-Cells™, the customer may contract to have K-M install the sensors. For all other sensors and transducers, installation must be performed by the customer.
2. Field wiring, conduit installation, junction box mounting, and signal processor mounting must be performed by the customer. AC power must be connected to the signal processor, but not energized, prior to K-M beginning work.

All field wiring will be checked for errors. The system will be powered up and checked for proper electrical operation. For best results, K-M requires moving a known amount of material, such as a truckload, for Live Load calibration. Live load calibration will be performed if actual material or weight devices can be moved. If it is not possible to move material, a pre-calibration will be performed. Recommendations for the optimal performance of the system will be provided.

On-site training will include simulation of the Live Load calibration process (if calibration could not be performed while K-M is on site) and instruction covering operation and maintenance of the system.

Troubleshooting

Kistler-Morse will troubleshoot systems for mechanical, electrical, calibration, and wiring errors. Normal component repairs will be made and wiring errors will be corrected, including replacement of non-repairable printed circuit boards.

Service Calls

K-M will perform on-site repair/ replacement services.

Return Material Authorization

If a part needs to be sent to the factory for repair, contact K-M's corporate office and ask for a Return Material Authorization (RMA) number. The RMA number identifies the part and its owner and must be included with the part when it is shipped to the factory.

Address and Telephone Numbers

Corporate Office

Kistler-Morse Corporation
19021 120th Avenue NE
Bothell, WA 98011-9511 USA

Phone: 425-486-6600
Toll Free (USA and Canada): 800-426-9010
Fax: 425-402-1500
www.kistler-morse.com

European Office

Kistler-Morse Corporation
Rucaplein 531
B2610 Antwerp, Belgium

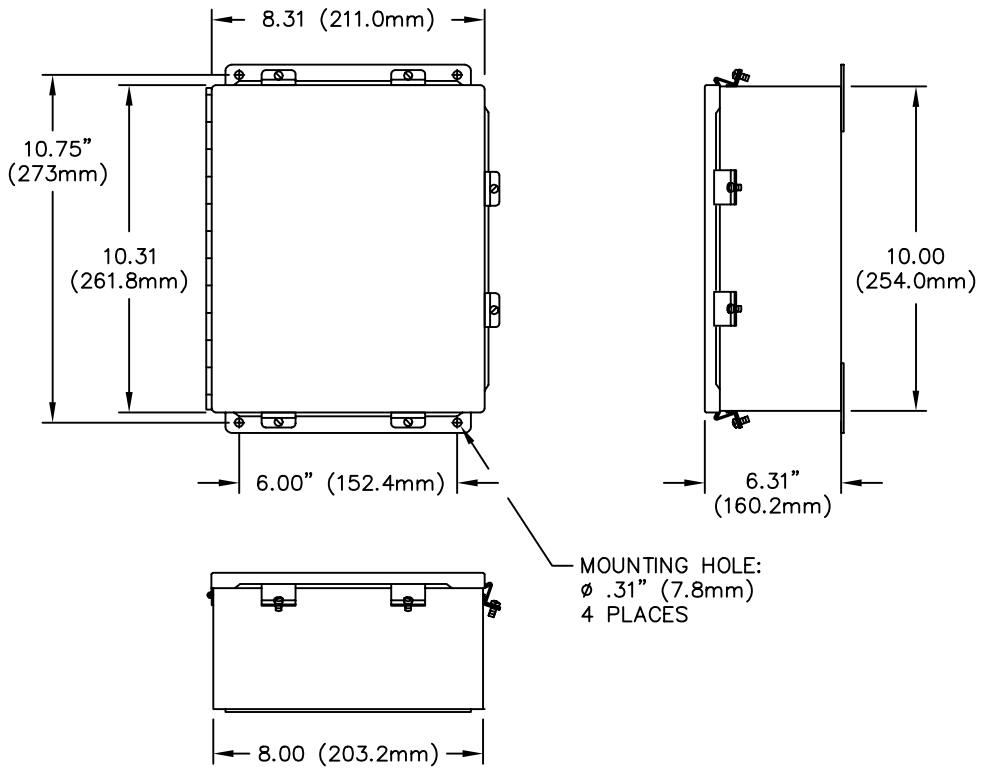
Phone: 32.3.218.99.99
Fax: 32.3.230.78.76

Appendix H. Technical Drawings

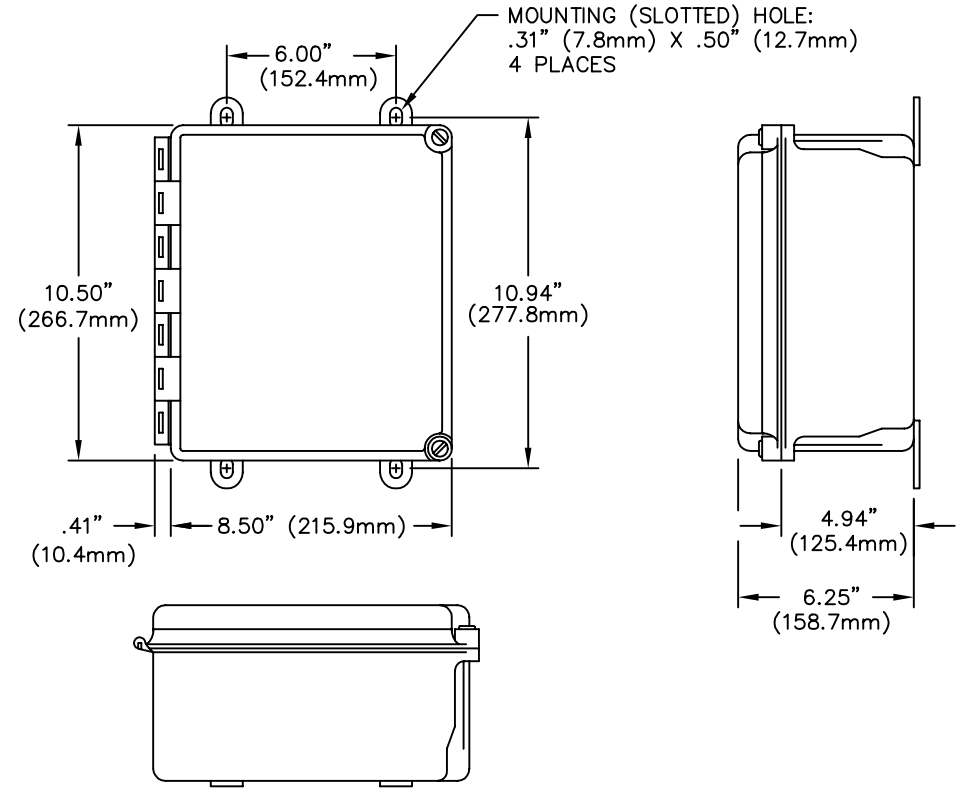
This appendix contains the following technical drawings for the STX signal processor:

Drawing No.	Drawing Title
TI-SP.STX-01	Model STX Enclosure/Boardset Installation Dimensions
TI-SP.STX-02	Model STX Interconnect Diagram
TI-SP.STX-03	Rack Mounted Model STX Termination PCB Interconnect Dia

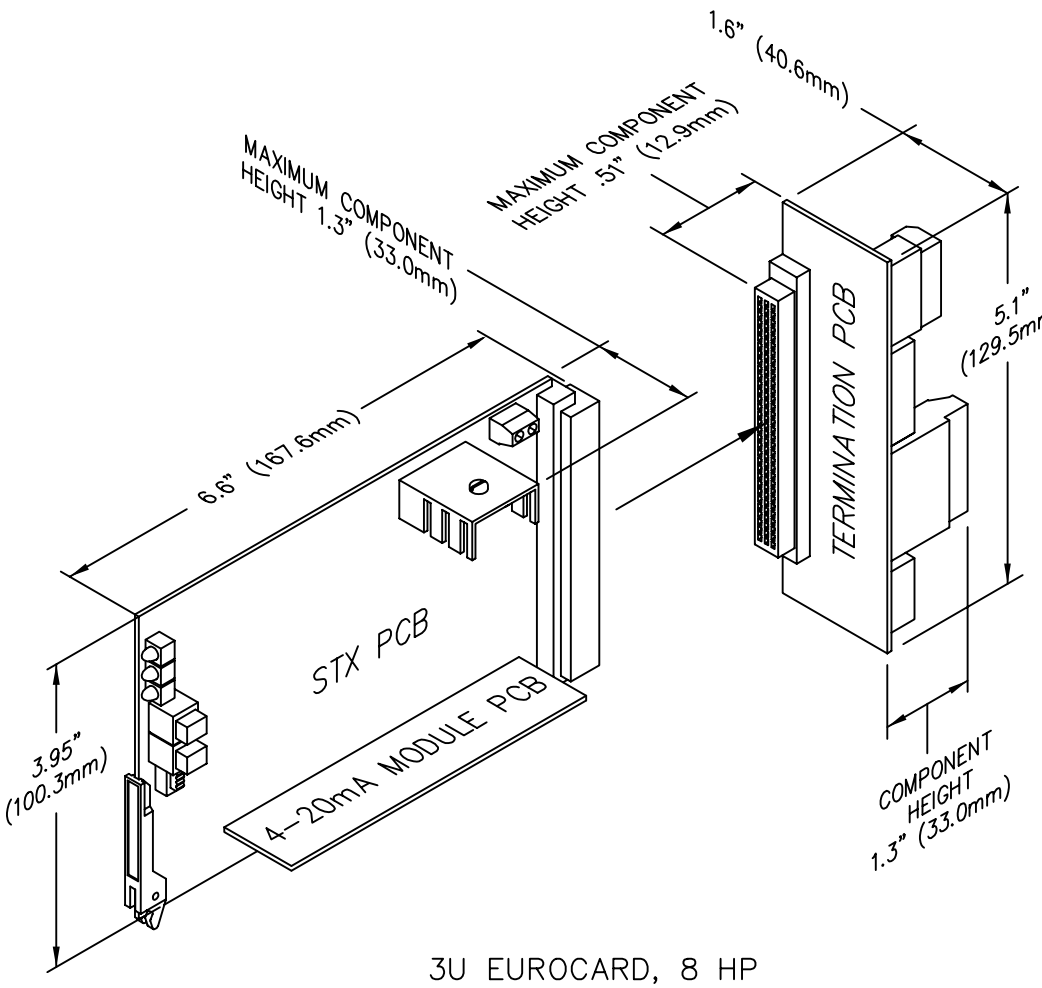
REVISIONS					
LTR	DESCRIPTION	INCORP.	CHECKED	APPROVED	DATE
NEW	INITIAL RELEASE	T.McMaster			



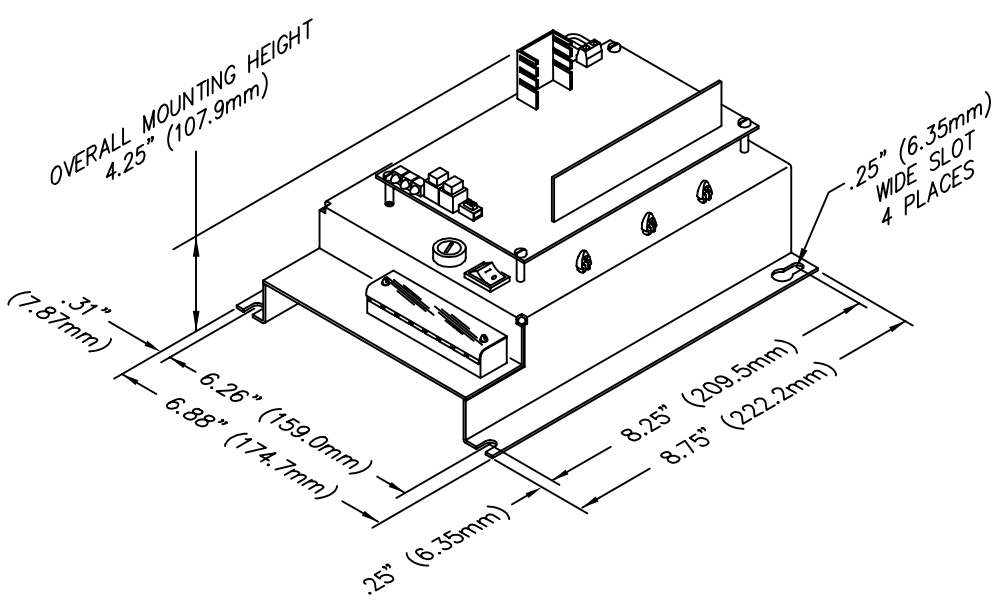
Nema-4X (STAINLESS STEEL) ENCLOSURE
INSTALLATION MOUNTING DIMENSIONS



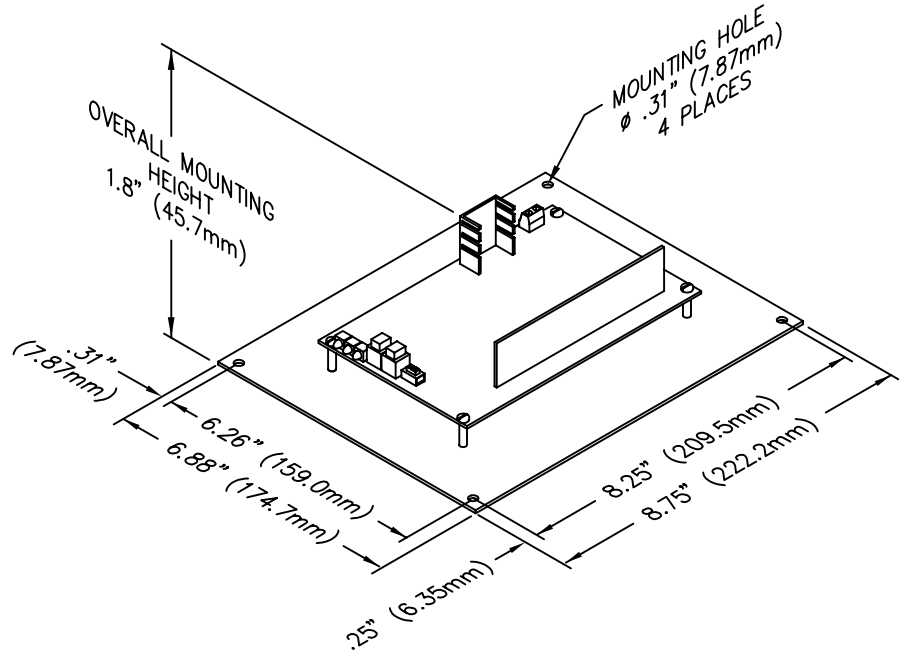
Nema-4X (FIBERGLASS) ENCLOSURE
INSTALLATION MOUNTING DIMENSIONS



3U EUROCARD, 8 HP
INSTALLATION MOUNTING DIMENSIONS



STX: POWER SUPPLY BRACKET ASSEMBLY
INSTALLATION MOUNTING DIMENSIONS



PANEL MOUNTED STX: WITHOUT POWER SUPPLY
INSTALLATION MOUNTING DIMENSIONS

APPROVALS	DATE
DRAWN: Tammy McMaster	02/16/94
CHECKED:	
PROJ. ENGR.:	
PRODUCTION:	
PURCHASING:	

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
TOLERANCES
DECIMAL .X± -- .XX± -- .XXX± --
ANGULAR ± -- .
DO NOT SCALE DRAWING
SCALE NONE
FINISH ---
USED ON: (REF ONLY) ---

Kistler-Morse Corp.
Redmond, Wa 98073

TITLE
MODEL STX
ENCLOSURE / BOARDSET
INSTALLATION DIMENSIONS

SIZE	DWG. No	REV.
B	TI-SP.STX-01	NEW

ACAD # SPSTX01 | DATE: 03/04/94 | SHT. 1 OF 1

2:09 p.m.

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. ALL WIRING SHOWN (LABELED) IS CUSTOMER INSTALLED.

2 ROUTE ALL AC WIRING SEPARATE FROM ALL OTHER WIRING.

3 THE ANALOG OUTPUT CABLE TYPE AND GAGE DEPENDS ON THE ENVIRONMENT, WIRE RUN LENGTH, AND ELECTRICAL LOAD. SHIELDED TWISTED PAIR CABLE IS SUGGESTED WHEN RUN WITH OTHER SIGNAL WIRES IN TRAYS OR CONDUIT AND/OR IN ELECTRICAL NOISY AREAS. A BRAIDED SHIELD IS SUGGESTED WHEN PULLING LONG CABLE RUNS THROUGH CONDUIT OR WITH OTHER SIGNAL WIRES. GROUND THE SHIELD ONLY AT THE DEVICE RECEIVING THE ANALOG OUTPUT. TWISTED PAIR CABLE IS SUGGESTED FOR LOW ELECTRICAL NOISE AREAS.

SUGGESTED JACKETED CABLE TYPES:

22-AWG BRAIDED SHIELD TWISTED PAIR: BELDEN No. 8441 OR EQUIVALENT.
22-AWG FOIL SHIELD TWISTED PAIR: BELDEN No. 9414 OR EQUIVALENT.
22-AWG TWISTED PAIR: BELDEN No. 8442 OR EQUIVALENT.

4 THE 0-20/4-20 CURRENT TRANSMITTER IS POWERED BY THE STX POWER SUPPLY. FOR APPLICATIONS REQUIRING AN EXTERNAL DC POWER SUPPLY FOR THE CURRENT LOOP, CONNECT THE WIRES TO "TB10" (EXT +/-) AND MOVE JUMPER ON "JP11" TO THE "EXT" POSITION. THE MAXIMUM VOLTAGE THAT MAY BE APPLIED TO THIS INPUT IS 50 VDC.

5 FOR 4-WIRE CONNECTION, JUMPER FROM +SENSE TO +EX AND FROM -SENSE TO -EX. JUMPER "J10" MUST BE IN THE "FULL" POSITION. JUMPER "JP8" IS CURRENTLY NOT IN USE.

6 WHEN USING SERIAL COMMUNICATIONS, POSITIONING THE ROCKER-ARM SWITCHES ON THE "S1" DIP SWITCH SETS THE ADDRESS OF THE STX. REFER TO THE SERIAL COMMUNICATION, CHAPTER OF THE OPERATORS MANUAL WHEN SETTING THE ADDRESS.

7 POWERING ADDITIONAL STX SYSTEMS FROM THE OPTIONAL POWER SUPPLY:

WHEN THE STX IS EQUIPPED WITH THE OPTIONAL 120 OR 240 VAC POWER SUPPLY, THAT POWER SUPPLY MAY ALSO SUPPLY POWER TO ADDITIONAL STX SYSTEMS NOT EQUIPPED WITH THE POWER SUPPLY OPTION. IF THIS OPERATION IS DESIRED, CARE MUST BE TAKEN THAT THE SUPPLY IS NOT OVERLOADED. USE THE FOLLOWING INFORMATION ON SUPPLY CAPACITY AND MAXIMUM CURRENT REQUIREMENTS TO DETERMINE IF ADDITIONAL POWER SUPPLIES ARE REQUIREMENTED.

1) THE POWER SUPPLY IS RATED AT 900mA AT 15 VDC, 60 HZ (810mA AMPERES AT 50 HZ). THE SUM OF ALL STX SYSTEMS AND SENSORS, INCLUDING THE STX ASSOCIATED WITH THE POWER SUPPLY MUST BE LESS THAN 900mA (810mA).

2) STX POWER REQUIREMENTS:

THE STX WITHOUT CURRENT OUTPUT OPTION REQUIRES 80mA.
THE STX WITH CURRENT OUTPUT OPTION REQUIRES 225mA.

3) SENSOR POWER REQUIREMENTS (THE STX PROVIDES UP TO 114.6mA EXCITATION CURRENT):

a. A Kistler-Morse LOAD STAND REQUIRES 16mA PER STAND (AT 12V EXCITATION).
b. A Kistler-Morse MICROCELL REQUIRES 4mA EACH (AT 12V EXCITATION).
c. A Kistler-Morse LOAD DISC REQUIRES 2.8mA EACH (AT 12V EXCITATION).
d. A Kistler-Morse L-CELL REQUIRES 11.6mA EACH (AT 12V EXCITATION).
e. A KISTLER-MORSE LOAD LINK III REQUIRES 11.6mA (AT 10V EXCITATION).
f. A 350 OHM LOAD CELL REQUIRES 28.6mA EACH (AT 10V EXCITATION).
g. CONSULT FACTORY FOR POWER REQUIREMENTS FOR SENSORS NOT LISTED.

8 THE TARE SWITCH IS A MOMENTARY DRY CONTACT SWITCH PROVIDED BY THE CUSTOMER. MAXIMUM CABLE LENGTH IS 100ft (30.5m). USE 22-AWG, 2-CONDUCTOR (TWISTED PAIR) SHIELDED CABLE (BELDEN 8441 or APPROVED EQUIVALENT).

9 TYPICAL CABLE FOR FULL-BRIDGE SENSORS:

FOR 4-WIRE FULL-BRIDGE FOIL GAGE LOAD CELL TRANSDUCERS, USE 20-AWG, 4-CONDUCTOR SHIELDED CABLE. MAXIMUM CABLE LENGTH IS 50ft (15.2m). REFER TO LOAD CELL MANUFACTURER FOR THEIR RECOMMENDED CABLE TYPE, COLOR CODE AND MAXIMUM CABLE DISTANCES.

FOR 6-WIRE FULL-BRIDGE FOIL GAGE LOAD CELL TRANSDUCERS, USE 18-AWG, 6-CONDUCTOR SHIELDED CABLE. MAXIMUM CABLE LENGTH IS 1000ft (304.8M). REFER TO LOAD CELL MANUFACTURER FOR THEIR RECOMMENDED CABLE TYPE, COLOR CODE AND MAXIMUM CABLE DISTANCES.

10 FOR TRANSDUCER/SIGNAL PROCESSOR SEPARATION DISTANCES UP TO 1,000 FEET, USE 18-AWG, THREE-CONDUCTOR SHIELDED CABLE (BELDEN 8791 OR EQUIVALENT) AT INTERCONNECT JUNCTION BOXES AND THE MODEL STX. DISTANCES UP TO 2,000 FEET REQUIRES 16-AWG, THREE-CONDUCTOR SHIELDED CABLE, (BELDEN 8618 OR EQUIVALENT) AS THE INTERCONNECT SIGNAL CABLE.

11 TO PREVENT GROUND LOOPS, CONNECT SIGNAL WIRE SHIELDS AT ONE END ONLY.

12 PINS FROM THE OPTIONAL 4-20mA CURRENT TRANSMITTER PCB PLUG IN HERE.

13 WHEN USING INTRINSIC SAFETY BARRIERS, (SEE DETAIL E AND DETAIL F) JUMPER "JP9" MUST BE SET TO "BARRIER" POSITION

14 CABLE TYPE: BELDEN 9368 OR EQUIVALENT. MAXIMUM SEPARATION BETWEEN STX AND BARRIER IS 100ft (30.5 METERS).

15 FOR ADDITIONAL INTRINSIC SAFETY BARRIER INSTALLATION DETAILS FOR FACTORY MUTUAL INSTALLATION REQUIREMENTS, SEE K-M DRAWING TI-SBI.FM-01.

REVISIONS

LTR	DESCRIPTION	INCORP.	CHECKED	APPROVED	DATE
NEW	Initial release	T.McMaster	T.K.M.	D.H.H.	3-10-94
A	Per ECO No. 3231	R.M. Collado	D.H.H.	D.H.H.	10/18/94
B	Per ECO No. 3262	R.M. Collado	M.C.	M.C.	02/24/95
C	Per ECO No. 3446	C.Blackburn/NTO	M.C.	S.A.SMITH	1/29/96
D	Per ECO No. 3493	C. Blackburn	--	K.P.M.	4/24/96
E	Per ECO No. 3881	R.M. Collado	R.M.C.	R.Q.	4/1/97
F	Per ECO No. 4336	R.M. Collado	S.A.S.	S.A.S.	2/4/99
G	Per ECO No. 4468	W.Kenney			

ECO ACCUMULATION:	APPROVALS	DATE
ECO No. 1:	DRAWN: Tammy McMaster	2/18/34
ECO No. 2:	CHECKED: T.K.M.	3-10-94
ECO No. 3:	PROJ. ENGR.: Don Hanson	3-10-94
ECO No. 4:	PRODUCTION:	
ECO NO. 5: INCORPORATE ABOVE ECO'S	PURCHASING:	

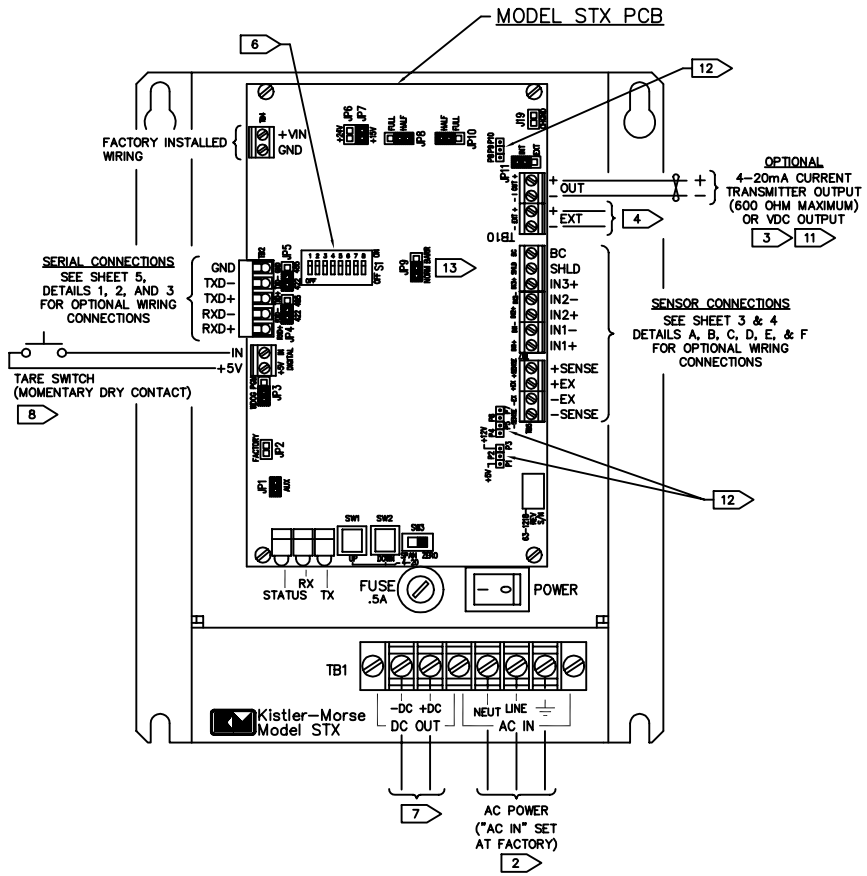
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
TOLERANCES
DECIMAL .X± -- .XX± -- .XXX± --
ANGULAR ±--°
DO NOT SCALE DRAWING
SCALE --
FINISH
USED ON: (REF ONLY)

Kistler-Morse Corp.
Bothell, WA 98011

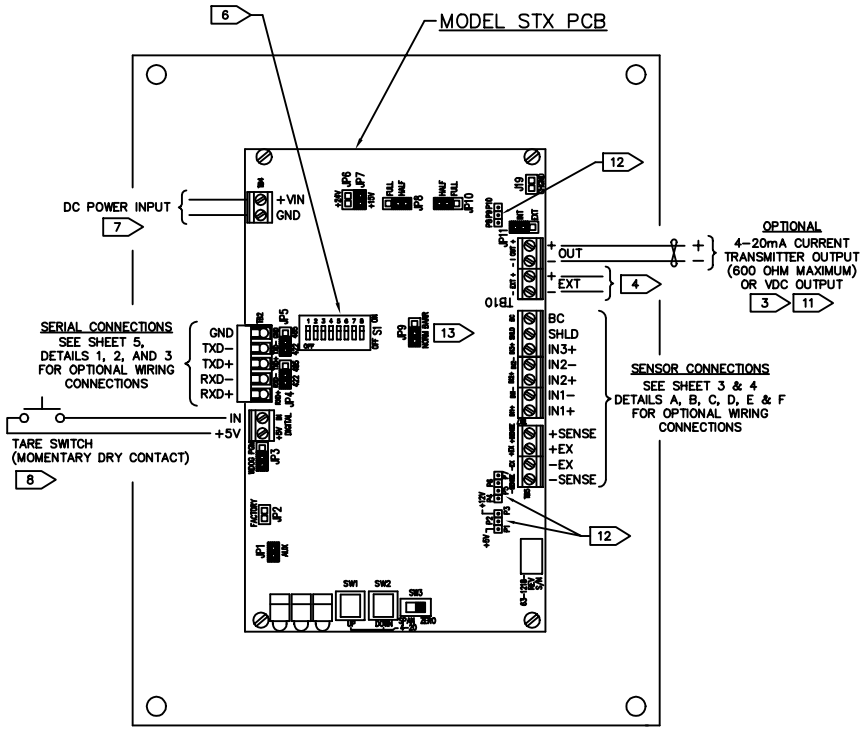
TITLE
MODEL STX
INTERCONNECT DIAGRAM

SIZE	DWG. No	REV.
B	TI-S.STX-02	G

ACAD # SPSTX02g | DATE: 5/4/99 | SHT. 1 OF 5



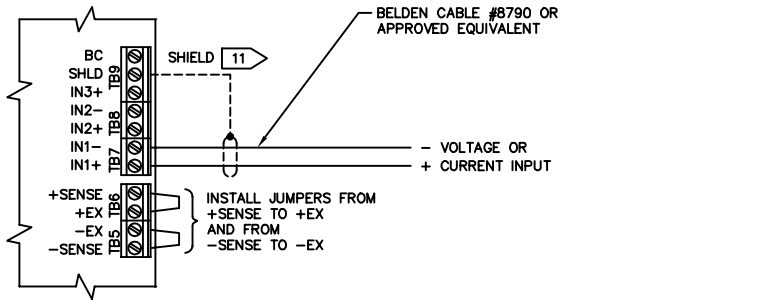
MODEL STX WITH OPTIONAL POWER SUPPLY



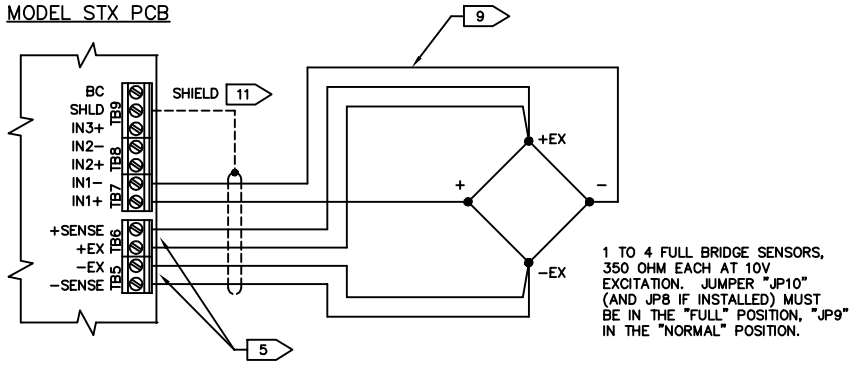
MODEL STX WITHOUT OPTIONAL POWER SUPPLY

SIZE	DWG. No.	REV.
B	TI–SP.STX–02	G
ACAD # SPSTX02g	DATE: 5/3/99	SHT. 2 OF 5

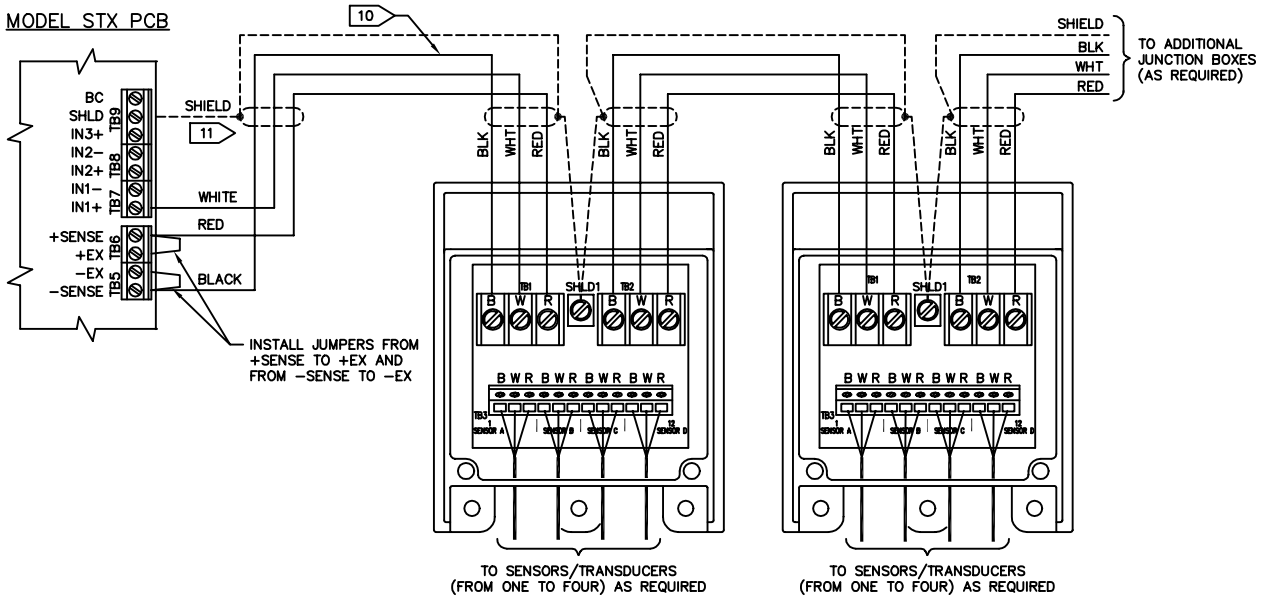
APS:



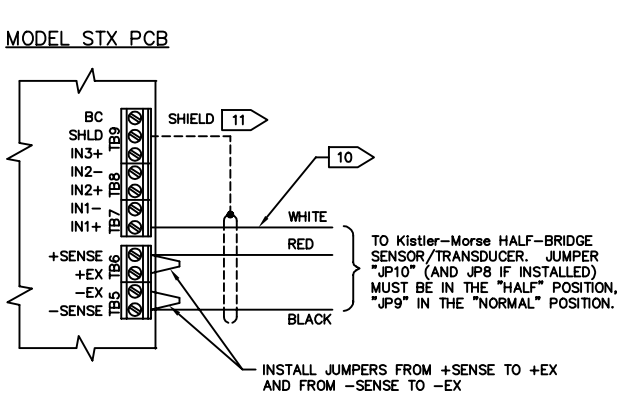
DETAIL A: VOLTAGE AND CURRENT CONNECTION



DETAIL B: FULL BRIDGE SENSOR CONNECTION
(SIX–WIRE WITH SENSE LINES)



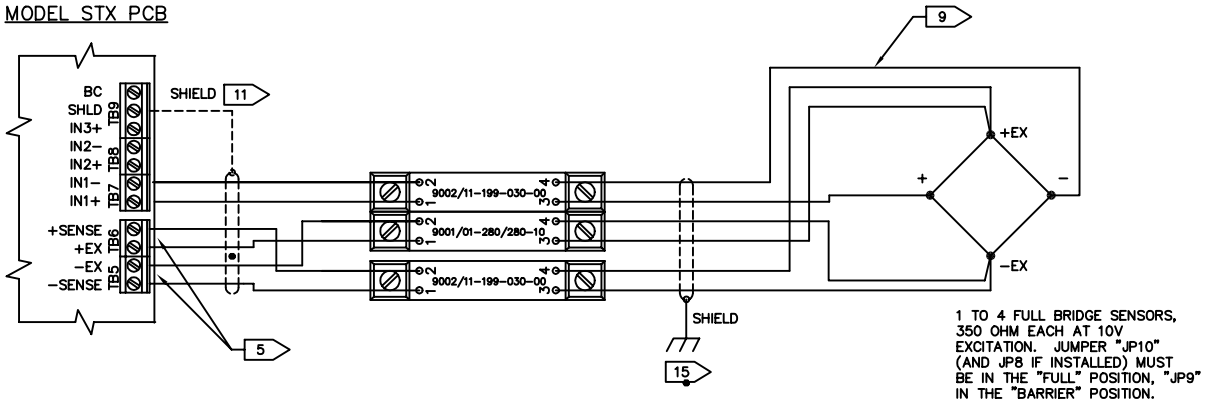
DETAIL C: K–M HALF–BRIDGE SENSORS CONNECTED TO
JUNCTION BOXES AND TO STX PCB (TYPICAL)



DETAIL D: K–M HALF–BRIDGE
SENSOR/TRANSDUCER CONNECTION

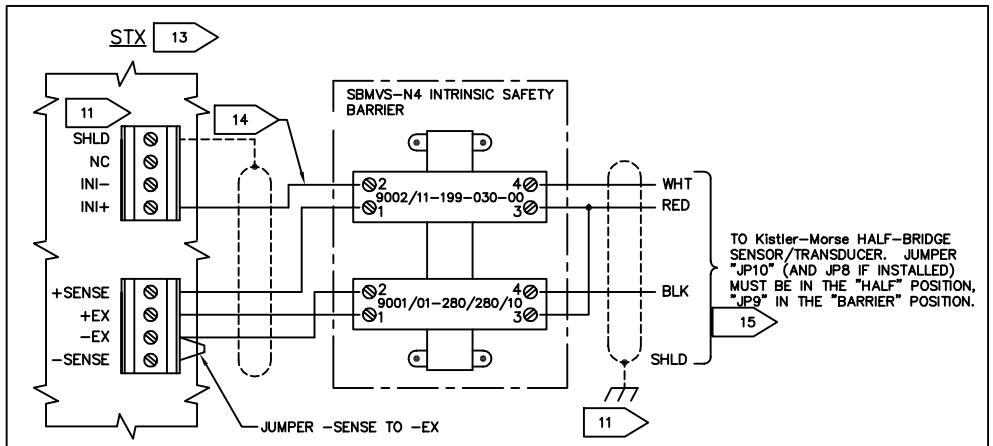
APS:

SIZE	DWG. No.	REV.
B	TI–SP.STX–02	G
ACAD # SPSTX02g	DATE: 5/3/99	SHT. 3 OF 5



DETAIL F: FULL BRIDGE SENSOR CONNECTION TO STAHL INTRINSIC SAFETY BARRIER SYSTEM (SIX-WIRE WITH SENSE LINES)

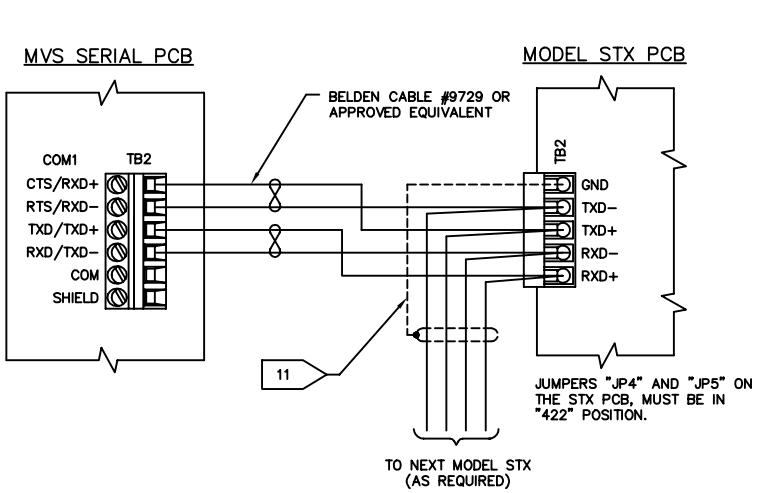
(FOR REFERENCE ONLY. REFER TO LOAD CELL MANUFACTURER FOR RECOMMENDED BARRIER TYPE CONNECTIONS.)



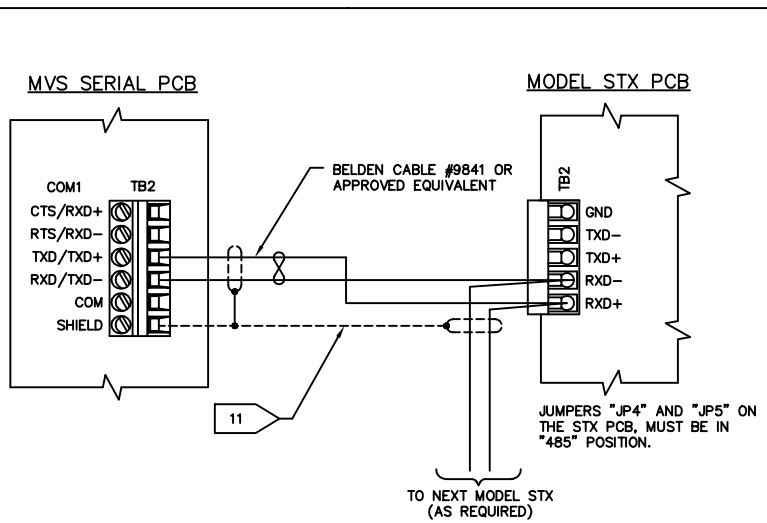
DETAIL E: K-M HALF-BRIDGE / STAHL I.S. BARRIER TO STX CONNECTION

SIZE	DWG. No.	REV.
B	TI-SP.STX-02	G
ACAD # SPSTX02g	DATE: 5/3/99	SHT. 4 OF 5

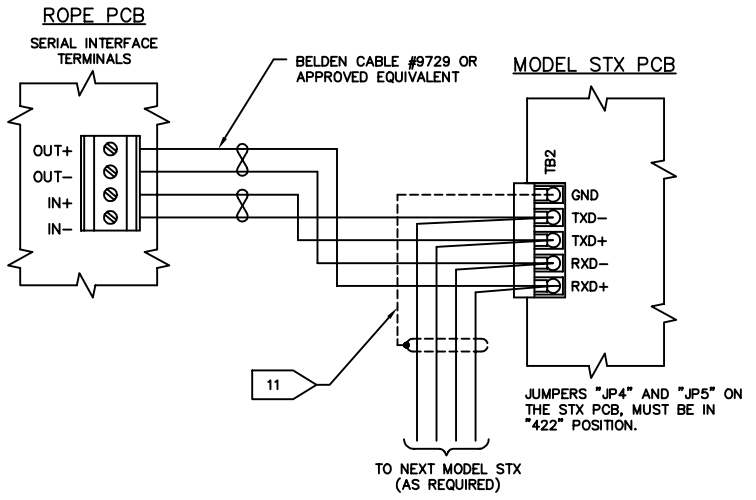
APS:



DETAIL 1: RS-422A SERIAL CONNECTION TO MVS



DETAIL 2: RS-485 SERIAL CONNECTION TO MVS



DETAIL 3: RS-422A SERIAL CONNECTION TO ROPE

APS:

SIZE	DWG. No	REV.
B	TI-SP.STX-02	G
ACAD # SPSTX02g	DATE: 5/3/99	SHT. 5 OF 5

REVISIONS					
LTR	DESCRIPTION	INCORP.	CHECKED	APPROVED	DATE
NEW	Initial release	T.McMaster	T.K.M.	D.H.H.	3-10-94
A	Per ECO No. 3232	R.M. Collado	D.H.H.	D.H.H.	10/18/94
B	Per ECO No. 3267	R.M. Collado	M.C.	M.C.	2/24/95
C	Per ECO No. 3447	C.Blackburn/ NTO	M.C.	S.A.SMITH	1/25/96
D	Per ECO No. 3493	C. Blackburn	--	K.P.M.	4/24/96
E	Per ECO No. 3882	R.M. Collado	R.M.C.	R.Q.	4/1/97
F	Per ECO No. 4337	R.M. Collado		S.A.SMITH	2/4/99
G	Per ECO No. 4468	W.Kenney			

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. ALL WIRING SHOWN (LABELED) IS CUSTOMER INSTALLED.

2. ROUTE ALL AC WIRING SEPARATE FROM ALL OTHER WIRING.

3 THE ANALOG OUTPUT CABLE TYPE AND GAGE DEPENDS ON THE ENVIRONMENT, WIRE RUN LENGTH, AND ELECTRICAL LOAD. SHIELDED TWISTED PAIR CABLE IS SUGGESTED WHEN RUN WITH OTHER SIGNAL WIRES IN TRAYS OR CONDUIT AND/OR IN ELECTRICAL NOISY AREAS. A BRAIDED SHIELD IS SUGGESTED WHEN PULLING LONG CABLE RUNS THROUGH CONDUIT OR WITH OTHER SIGNAL WIRES. GROUND THE SHIELD ONLY AT THE DEVICE RECEIVING THE ANALOG OUTPUT. TWISTED PAIR CABLE IS SUGGESTED FOR LOW ELECTRICAL NOISE AREAS.

SUGGESTED JACKETED CABLE TYPES:

22-AWG BRAIDED SHIELD TWISTED PAIR: BELDEN No. 8441 OR EQUIVALENT.
22-AWG FOIL SHIELD TWISTED PAIR: BELDEN No. 9414 OR EQUIVALENT.
22-AWG TWISTED PAIR: BELDEN No. 8442 OR EQUIVALENT.

4 THE 0-20/4-20 CURRENT TRANSMITTER IS POWERED BY THE STX POWER SUPPLY. FOR APPLICATIONS REQUIRING AN EXTERNAL DC POWER SUPPLY FOR THE CURRENT LOOP, CONNECT THE WIRES TO "TB4" (EXT +/-) AND MOVE JUMPER ON "JP11" TO THE "EXT" POSITION. THE MAXIMUM VOLTAGE THAT MAY BE APPLIED TO THIS INPUT IS 50 VDC.

5 FOR 4-WIRE CONNECTION, JUMPER FROM +SENSE TO +EX AND FROM -SENSE TO -EX. JUMPER "J10" MUST BE IN THE "FULL" POSITION. JUMPER "JP8" IS CURRENTLY NOT IN USE.

6 WHEN USING SERIAL COMMUNICATIONS, POSITIONING THE ROCKER-ARM SWITCHES ON THE "S1" DIP SWITCH SETS THE ADDRESS OF THE STX. REFER TO THE SERIAL COMMUNICATION, CHAPTER OF THE OPERATORS MANUAL WHEN SETTING THE ADDRESS.

7 DC POWER INPUT USED TO PROVIDE DC POWER TO THE STX PCB WHEN NOT USED IN AN MVS RACK. THE POWER SUPPLY CAPACITY IS DETERMINED BY ADDING ADDING THE STX POWER REQUIREMENTS PLUS THE SENSOR POWER REQUIREMENTS.

POWER REQUIREMENTS:

14.5VDC TO 30VDC, 80mA WITHOUT OPTIONAL 0-20/4-20 OUTPUT,
225mA WITH OPTIONAL 0-20/4-20 OUTPUT.

SENSOR POWER REQUIREMENTS (STX PROVIDES UP 114.6mA EXCITATION CURRENT):

a. A Kistler-Morse LOAD STAND REQUIRES 16mA PER STAND (AT 12V EXCITATION).
b. A Kistler-Morse MICROCELL REQUIRES 4mA EACH (AT 12V EXCITATION).
c. A Kistler-Morse LOAD DISC REQUIRES 2.8mA EACH (AT 12V EXCITATION).
d. A Kistler-Morse L-CELL REQUIRES 11.6mA EACH (AT 12V EXCITATION).
e. A KISTLER-MORSE LOAD LINK III REQUIRES 11.6mA (AT 10V EXCITATION).
f. A 350 OHM LOAD CELL REQUIRES 28.6mA EACH (AT 10V EXCITATION).
g. CONSULT FACTORY FOR POWER REQUIREMENTS FOR SENSORS NOT LISTED.

8 THE TARE SWITCH IS A MOMENTARY DRY CONTACT SWITCH PROVIDED BY THE CUSTOMER. MAXIMUM CABLE LENGTH IS 100ft (30.5m). USE 22-AWG, 2-CONDUCTOR (TWISTED PAIR) SHIELDED CABLE (BELDEN 8441 or APPROVED EQUIVALENT).

9 TYPICAL CABLE FOR FULL-BRIDGE SENSORS:

FOR 4-WIRE FULL-BRIDGE FOIL GAGE LOAD CELL TRANSDUCERS, USE 20-AWG, 4-CONDUCTOR SHIELDED CABLE. MAXIMUM CABLE LENGTH IS 50ft (15.2m). REFER TO LOAD CELL MANUFACTURER FOR RECOMMENDED CABLE TYPE, COLOR CODE AND MAXIMUM CABLE DISTANCES.

FOR 6-WIRE FULL-BRIDGE FOIL GAGE LOAD CELL TRANSDUCERS, USE 18-AWG, 6-CONDUCTOR SHIELDED CABLE. MAXIMUM CABLE LENGTH IS 1000ft (304.8M). REFER TO LOAD CELL MANUFACTURER FOR THEIR RECOMMENDED CABLE TYPE, COLOR CODE, AND MAXIMUM CABLE DISTANCES.

10 FOR TRANSDUCER/SIGNAL PROCESSOR SEPARATION DISTANCES UP TO 1,000 FEET, USE 18-AWG, THREE-CONDUCTOR SHIELDED CABLE (BELDEN 8791 OR EQUIVALENT) AT INTERCONNECT JUNCTION BOXES AND THE MODEL STX. DISTANCES UP TO 2,000 FEET REQUIRES 16-AWG, THREE-CONDUCTOR SHIELDED CABLE, (BELDEN 8618 OR EQUIVALENT) AS THE INTERCONNECT SIGNAL CABLE.

11 TO PREVENT GROUND LOOPS, CONNECT SIGNAL WIRE SHIELDS AT ONE END ONLY.

12 PINS FROM THE OPTIONAL 4-20mA CURRENT TRANSMITTER PCB PLUG IN HERE.

13 WHEN USING INTRINSIC SAFETY BARRIERS, (SEE DETAIL E AND DETAIL F) JUMPER "JP9" MUST BE SET TO "BARRIER" POSITION

14 CABLE TYPE: BELDEN 9368 OR EQUIVALENT. MAXIMUM SEPARATION BETWEEN STX AND BARRIER IS 100ft (30.5 METERS).

15 FOR ADDITIONAL INTRINSIC SAFETY BARRIER INSTALLATION DETAILS FOR FACTORY MUTUAL INSTALLATION REQUIREMENTS, SEE K-M DRAWING TI-SBI.FM-01.

ECO ACCUMULATION:	APPROVALS	DATE
ECO No. 1:	DRAWN: Tammy McMaster	2/18/94
ECO No. 2:	CHECKED: T.K.M.	3-10-94
ECO No. 3:	PROJ. ENGR.: Don Hanson	3-10-94
ECO No. 4:	PRODUCTION:	
ECO NO. 5: INCORPORATE ABOVE ECO'S	PURCHASING:	

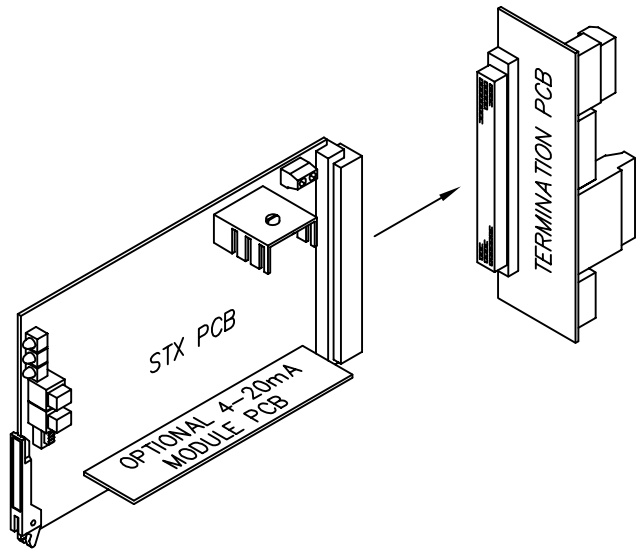
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
TOLERANCES
DECIMAL: .X± --, .XX± --, .XXX± --
ANGULAR: ±--÷
DO NOT SCALE DRAWING
SCALE --
FINISH
USED ON: (REF ONLY)

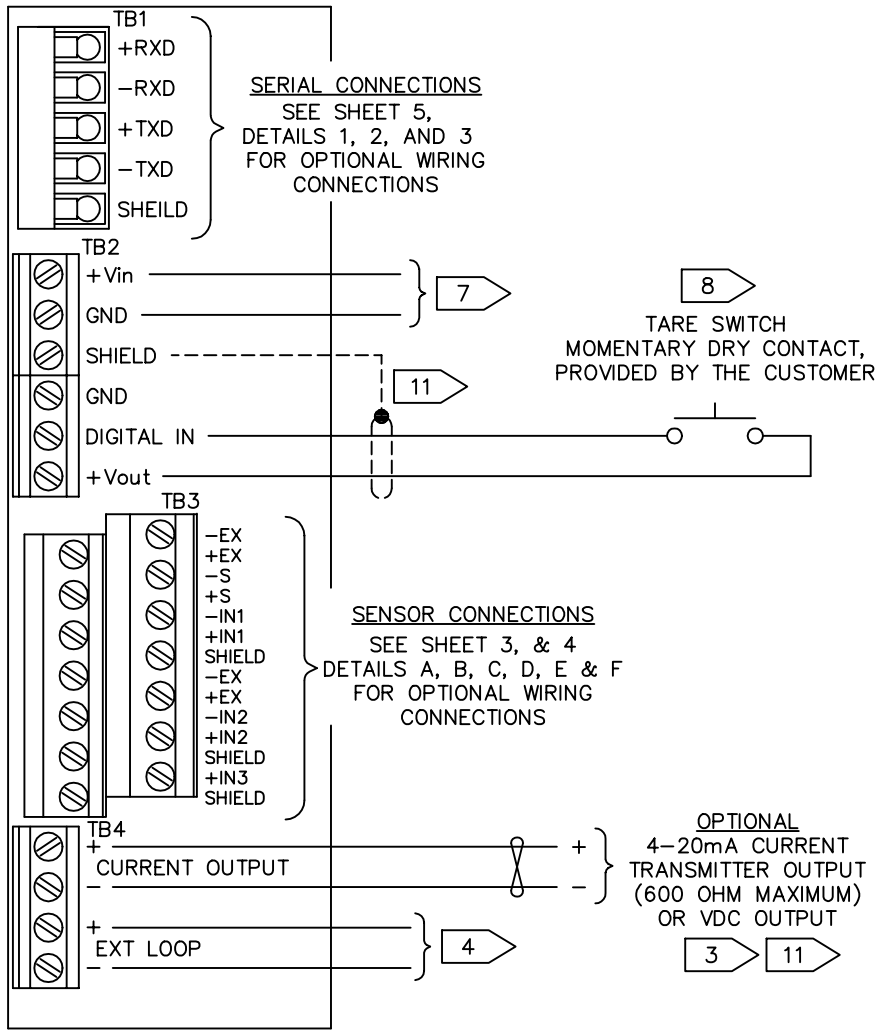
Kistler-Morse Corp.
Bothell, WA 98011

TITLE
RACK MOUNTED
MODEL STX TERMINATION PCB
INTERCONNECT DIAGRAM

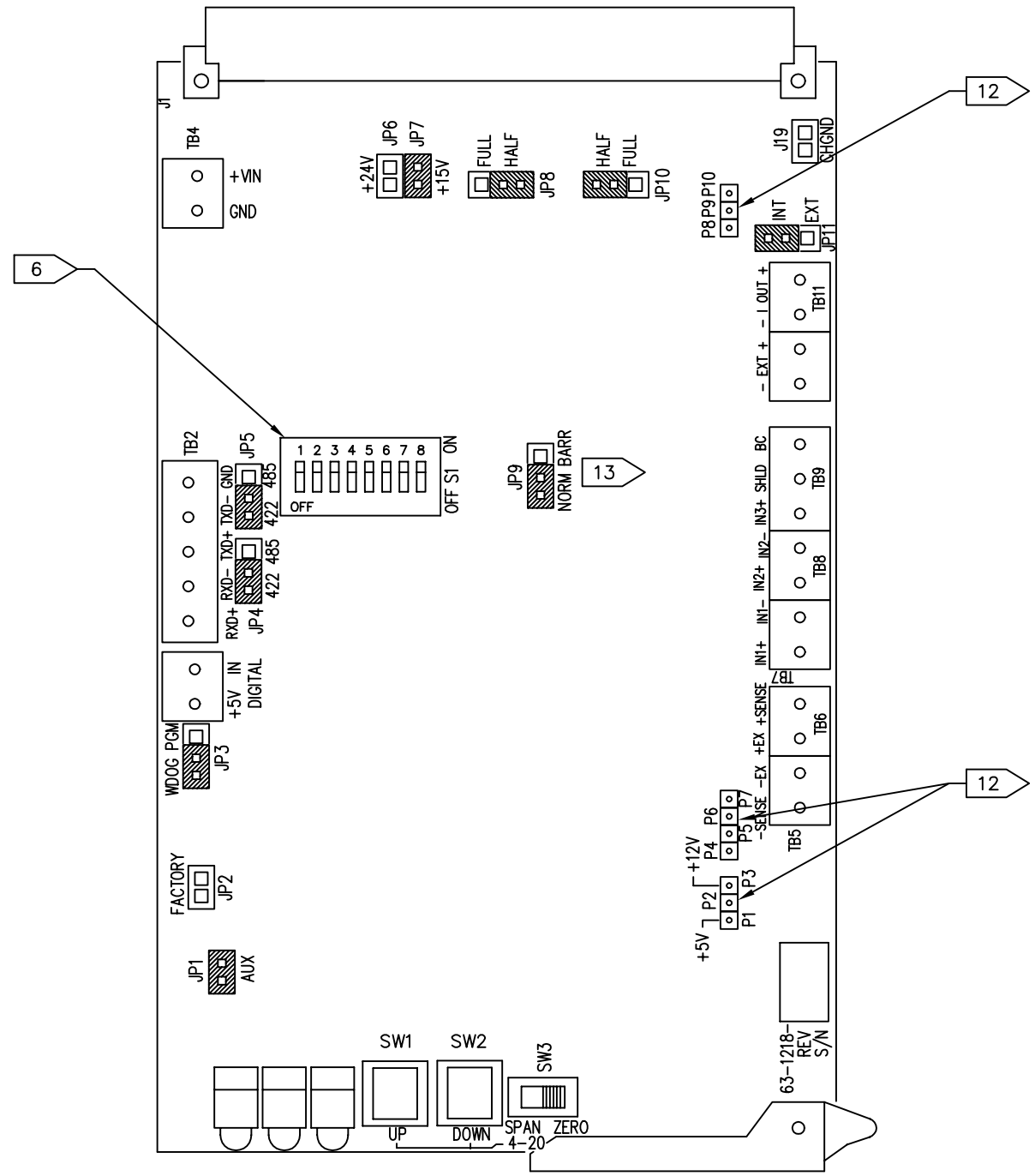
SIZE	DWG. No	REV.
B	TI-SP.STX-03	G 07:30

ACAD # SPSTX03g | DATE:03/24/99 | SHT. 1 OF 5





STX TERMINATION PCB

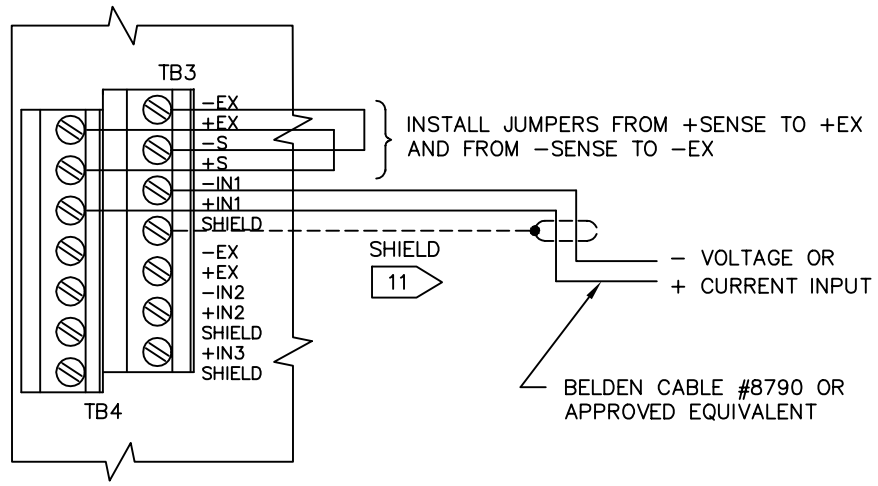


STX PCB

APS:

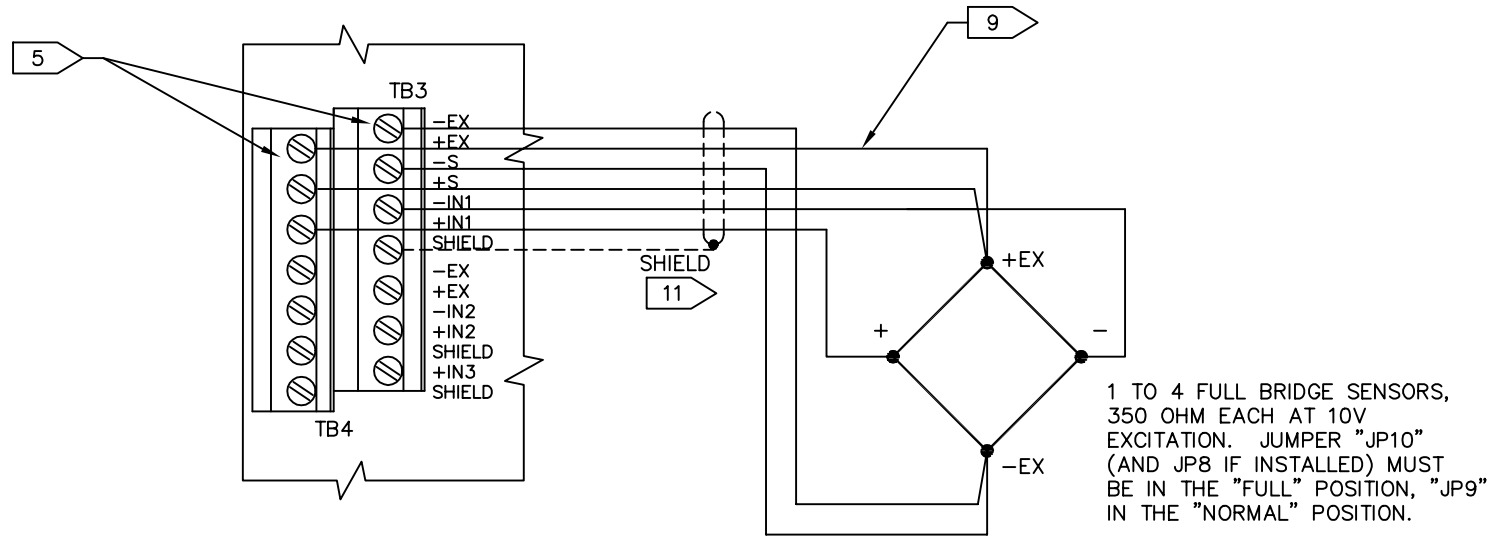
SIZE	DWG. No	REV.
B	TI−SP.STX−03	G 09:18
ACAD # SPSTX03g	DATE: 5/5/99	SHT. 2 OF 5

MODEL STX TERMINATION PCB

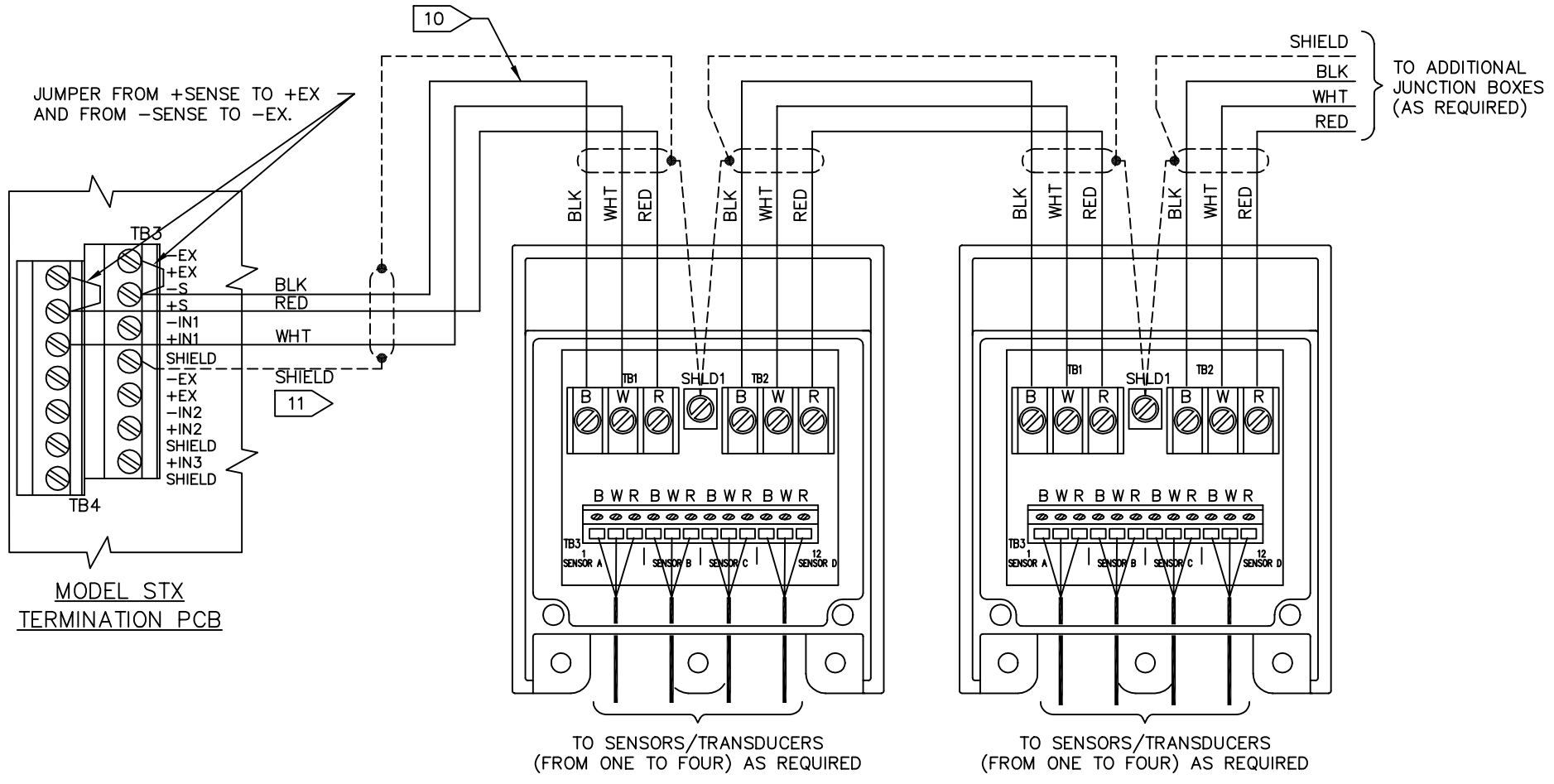


DETAIL A: VOLTAGE AND CURRENT CONNECTION

MODEL STX TERMINATION PCB

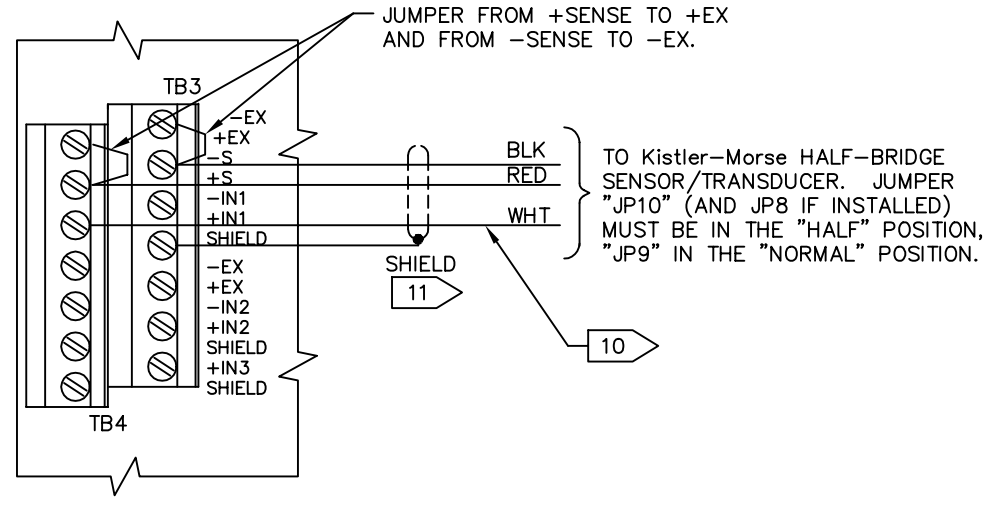


DETAIL B: FULL BRIDGE SENSOR CONNECTION
(SIX–WIRE WITH SENSE LINES)



DETAIL C: K–M HALF–BRIDGE SENSORS CONNECTED TO
JUNCTION BOXES AND TO STX PCB (TYPICAL)

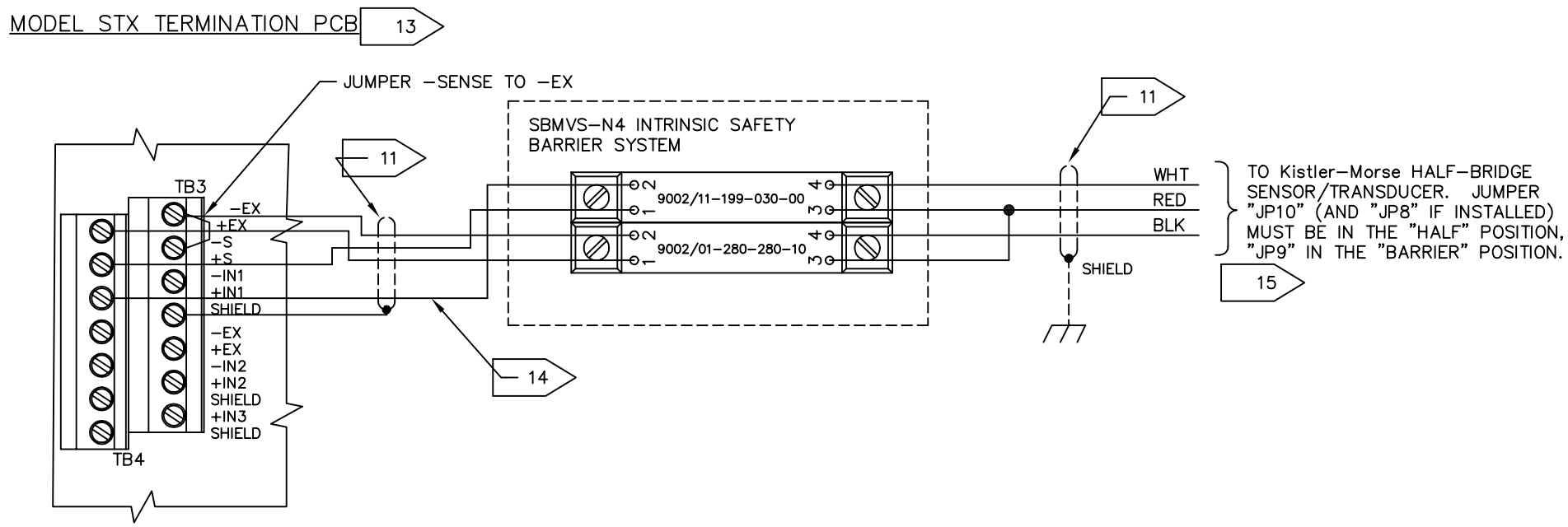
MODEL STX TERMINATION PCB



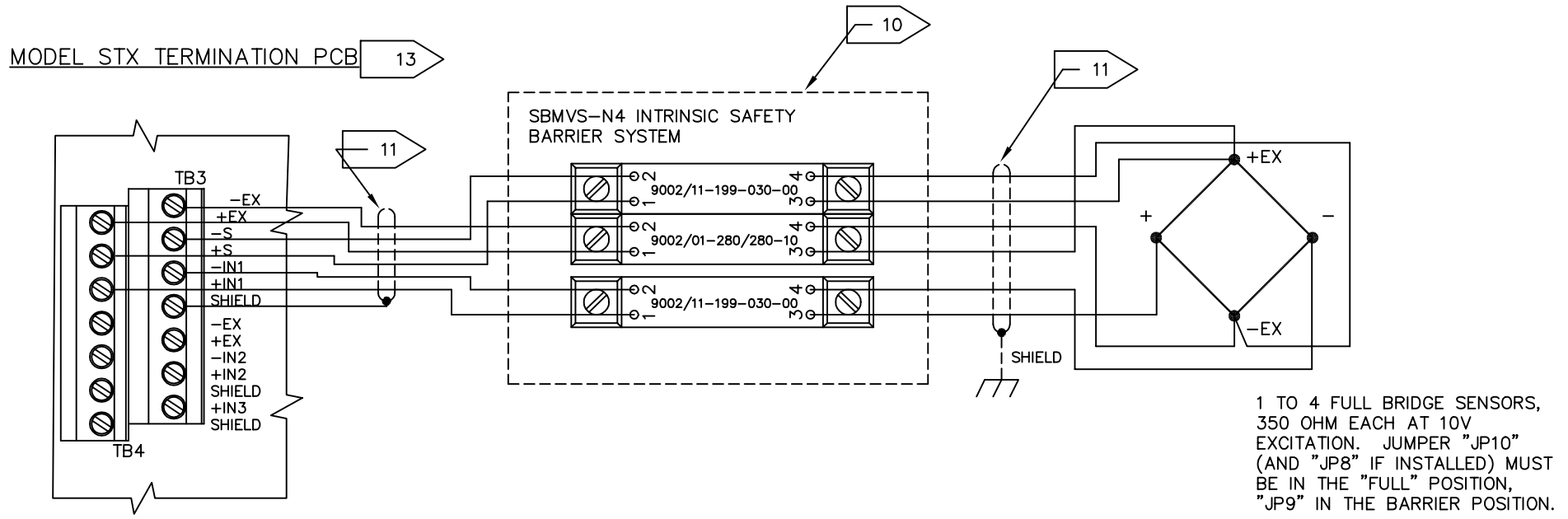
DETAIL D: K–M HALF–BRIDGE
SENSOR/TRANSDUCER CONNECTION

APS:

SIZE	DWG. NO	REV.
B	TI–SP.STX–03	G 09:18
ACAD # SPSTX03g	DATE: 5/5/99	SHT. 3 OF 5



DETAIL E: K−M HALF−BRIDGE / STAHL INTRINSIC SAFETY BARRIER TO STX

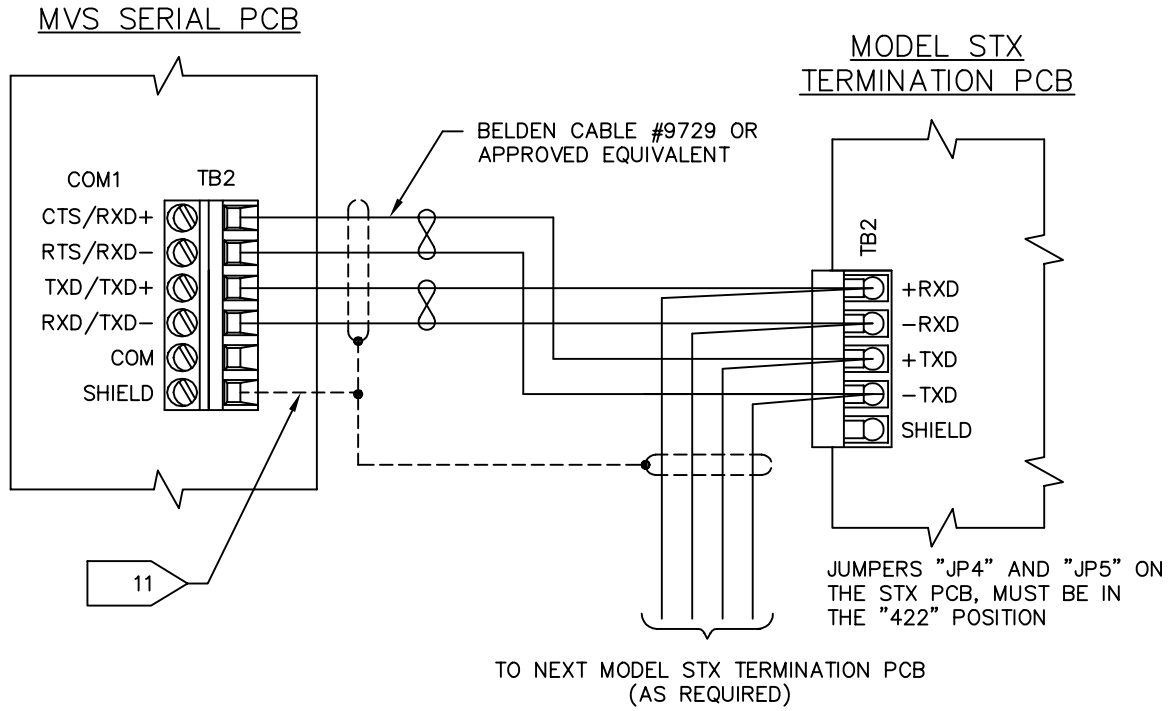


DETAIL F: FULL BRIDGE SENSOR / STAHL INTRINSIC SAFETY BARRIER TO STX

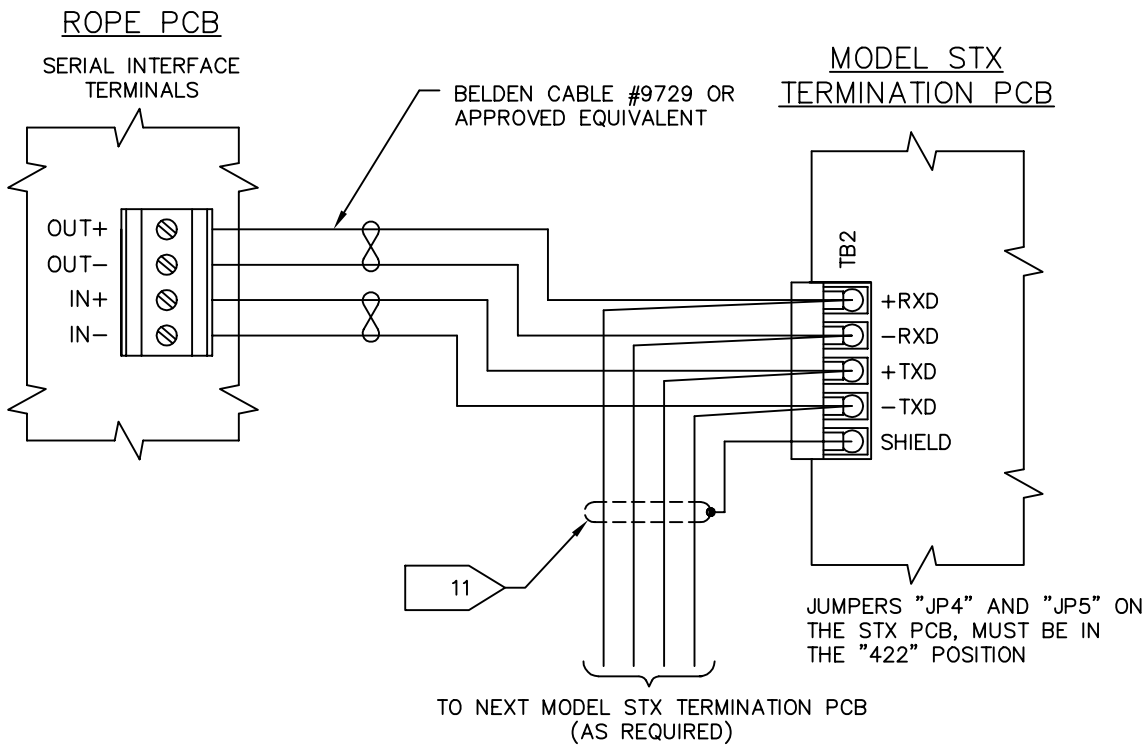
(SIX−WIRE WITH SENSE LINES)

APS:

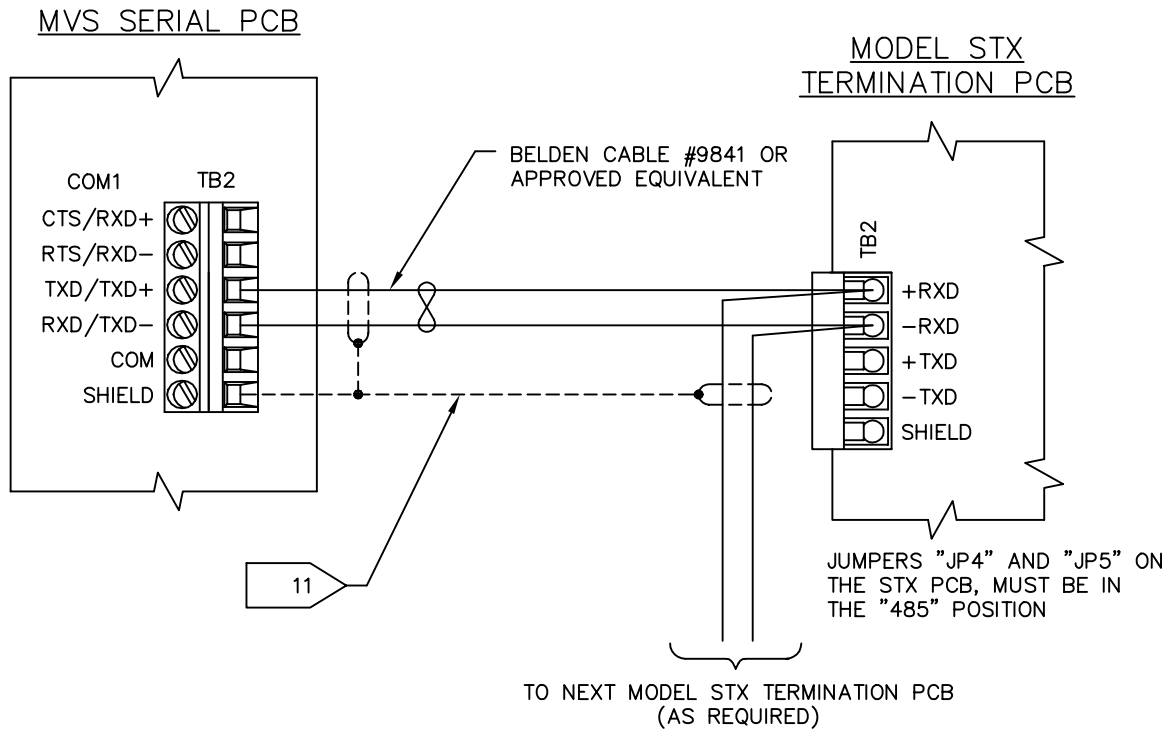
SIZE	DWG. No	REV.
B	TI−SP.STX−03	G 09:18
ACAD # SPSTX03g	DATE: 5/5/99	SHT. 4 OF 5



DETAIL 1: RS–422A SERIAL CONNECTION TO MVS



DETAIL 3: RS–422A SERIAL CONNECTION TO ROPE



DETAIL 2: RS–485 SERIAL CONNECTION TO MVS

APS:

SIZE	DWG. No	REV.
B	TI–SP.STX–03	G 09:18
ACAD # SPSTX03g	DATE: 5/5/99	SHT. 5 OF 5

5/5/99

Appendix I. MVS-STX Menu Tree and Hot Keys

This appendix contains the MVS-STX menu tree and a summary of commands used when channel monitoring (hot keys). Note that the MVS-STX menu tree is also presented in a larger format in Chapter 4, MVS-STX Menu Tree, Keyboard Functions, and Quick Start.

Hot Keys

Following is a summary of the keyboard functions (hot keys) you can use when channel monitoring.

- **Switch from Auto to Manual Mode or vice versa** —
  Press the Auto/Man Key (Auto LED illuminates when MVS is in Auto Mode).

- **Scroll through Channels when in Manual Mode** —
  Press the Up or Down Arrow Key.

- **Switch from Channel Monitoring to Menu Tree —**
  Press the Menu Key while in Manual Mode.

- **Tare Vessel** —
  Press the Shift Key (Shift LED illuminates when Shift Key is on). Then, press the Tare/Net/Gross Key.

- **Switch from Gross to Net Weight or vice versa** —
  Ensure the Shift Key is off (Shift LED is not illuminated). Then, press the Tare/Net/Gross Key.

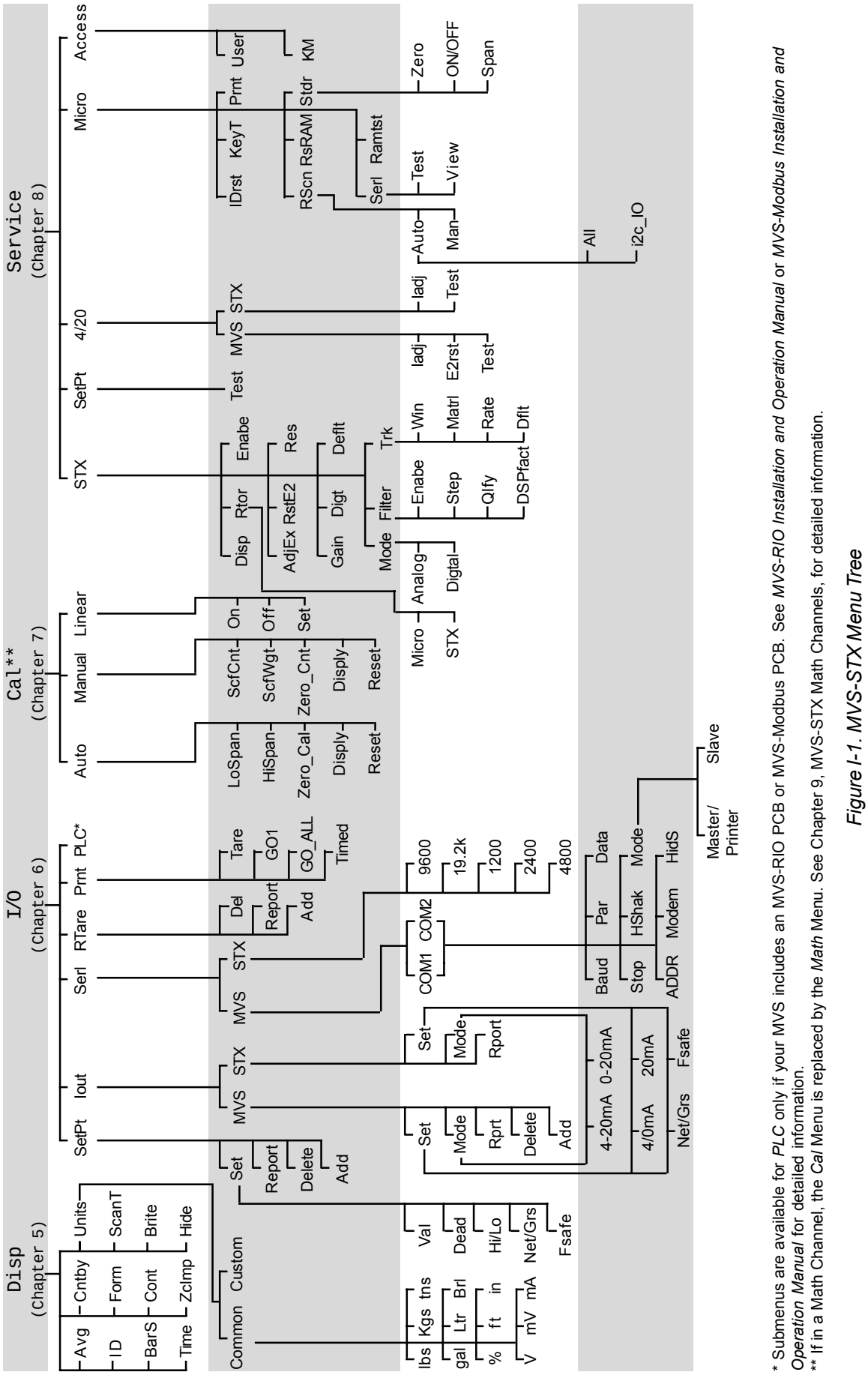
- **Switch from Numerical to Bar Graph display or vice versa** —
  If you set up the bargraph (see Chapter 5, MVS-STX Display Menu), press the Enter Key while in Manual Mode.

- **Enable or Disable *Hide* function** —
  Press the Shift Key (Shift LED illuminates when Shift Key is on). Then, press the '9' Key.

- **View Factory-Set ID** —
  Press the Esc Key while in Manual Mode. The display top line shows the factory-set channel ID on the left.

- **View Serial Address for Signal Processor PCB** —
  Press the Esc Key while in Manual Mode. The display top line shows the serial address of the signal processor PCB associated with the channel you are currently monitoring.

- **Display Current MVS Software Revision letter and Date of Release** —
  Press the '.' Key while in Manual Mode.



* Submenus are available for *PLC* only if your MVS includes an MVS-RIO PCB or MVS-Modbus PCB. See *MVS-RIO Installation and Operation Manual* or *MVS-Modbus Installation and Operation Manual* for detailed information.

** If in a Math Channel, the *Cal* Menu is replaced by the *Math* Menu. See Chapter 9, MVS-STX Math Channels, for detailed information.

Figure I-1. MVS-STX Menu Tree