EYE-HYE

REMOTE 4-20 MA BARGRAPH LEVEL INDICATOR

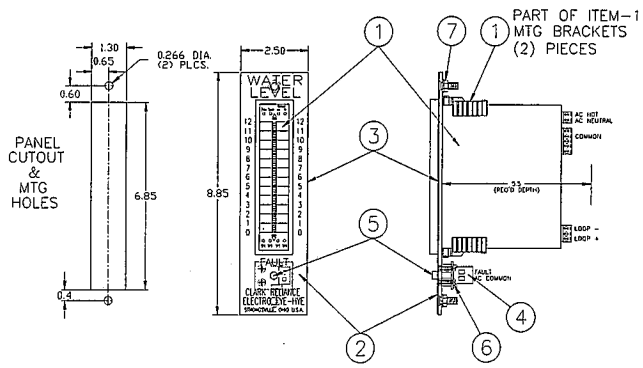
MODEL: RTCBS-120V
SMALL 4 INCH

ASSEMBLY, SETUP, CALIBRATION, AND OPERATION INFORMATION

REV 00 – 03/11/2008 – Original draft

A.) SYSTEM COMPONENTS

The Clark Reliance model RTCBS-120V 4 inch bargraph assembly comes complete with a panel mounted bargraph engraved with the customers specified scale units. The complete assembly can be mounted in a control panel or enclosure up to ½ inch thick per the cutout information in Figure 1.



ITEM	QTY	PART NUMBER	DESCRIPTION	REMARKS	CML
7	2	X171271	NUT, SS HEX 1/4-20		X
6	2	X172985	SCREW, PH PHILIPS 6-32x1/4		X
5	1	RECID-128	BEZEL, RED LED PANEL		X
4	1	RECID-131	PCB ASSY., FAULT DET.	(EI7383A)	
3	1	RECID-139	PANEL ASSY., EH SM BARGRAPH	(EI7377A)	
2	1	RECID-132	NAMEPLATE, EH SM BARGRAPH	(EI7378A)	
1	1	RECID-129	DISPLAY, SM. BARGRAPH	TEXMATE OEM	

Figure 1

B.) BARGRAPH HARDWARE ASSEMBLY AND SETUP

Before the bargraph, item-1 in Figure 1, is assembled into panel items 2 and 3, it needs to have its hardware setup. To accomplish this, carefully remove the rear plastic cover of the bargraph with a small slotted screwdriver by gently depressing the (4) snap tabs on the sides, (two on each side). Then carefully slide out the inner PCB by gently grabbing it with a pair of needle-nose pliers. Set it aside.

Proceed to gently remove the front black plastic bezel by popping the snap tabs on the sides with the blade of the screwdriver. Then remove the inner plastic window and printed scale gradicle exposing the front display PCB. The PCB pops out by flexing the snap tabs on the sides of the plastic case. When the PCB assy. pops out, verify or set all (9) 0.1 inch jumpers on the inner PCB, in the "open" or non-shorting position. Re-assemble the entire front of the unit.
(Note: Once your familiar with the location of the (9) 0.1 inch jumpers, you can verify that they're set correctly from the rear opening of the enclosure, without taking the front panel apart).

Next, viewing the large inner PCB that was taken out first, with the I/O connectors on your left, locate the (3) groups of 0.1 inch jumpers at the top of the PCB. Verify or set that NO excitation is used, CURRENT is selected, and that 20 MA is selected. Re-assemble the bargraph. Then proceed to complete the entire assembly shown in Figure 1.

C.) CALIBRATION SETUP

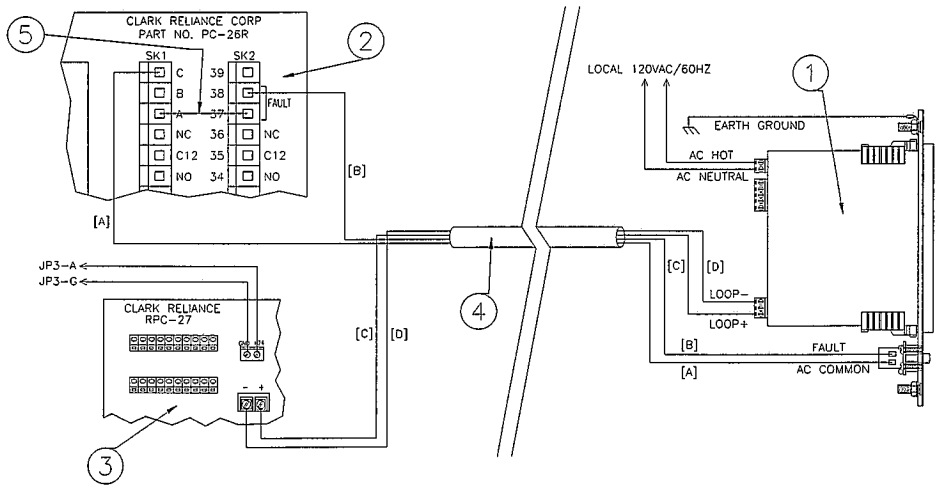
Calibration should be completed with the Eye-Hye system it is being configured with. The instructions in this section are for calibrating a single connected RTCBx-120V bargraph unit. In the event two are more are desired, see Section F.

The following items will be needed to complete the rest of the setup, calibration, and operational procedure.

1.) The UUT(s), the configuring RTCBS-120V(s).
2.) The Eye-Hye Control system configured with a RPC-27 4-20 mA output PCB assy.
3.) An RECID-71 Probe Input Exerciser.
4.) RECID-69/70 Fault detector
5.) DVM (measuring XX.XX DC milliamps).
6.) Column probe spacing information
7.) The necessary test wiring.

Connect the complete Eye-Hye system using the items above wired per Figure 2. Note the following when connecting all the components.

8.) The bargraph AC input is connected independently from the Eye-Hye base system via 85-265 VAC.
9.) The test wiring shown is either a 4-conductor cable or 2 twisted pairs of #18 AWG wire or better.
10.) The RECID-71 Exerciser is plugged into connector PL1 in the top of the Eye-Hye RPC-26R Mother Board and has all input switches in the OFF position.
11.) The probe inputs of the RPC-27 4-20 mA PCB assy. are properly connected to the appropriate SK1 connections of the Eye-Hye RPC-26R Mother Board.
12.) The 24 VAC power input connection is properly connected to the appropriate JP3-x connections of the Eye-Hye RPC-26R Mother Board.
13.) The LOOP and FAULT connections to the RTCBS-120v are properly connected to the appropriate SK1 and SK2 connections of the Eye-Hye RPC-26R Mother Board.
14.) The Eye-Hye's RPC-27 4-20 mA PCB assy. is a 2-wire sourcing transmitter. External VDC loop excitation is not required.



ITEM	QTY	PART NUMBER	DESCRIPTION	REMARKS	CML
5	X	(CUSTOMER)	WIRE, #16AWG	JUMPER	X
4	X	(CUSTOMER)	CABLE, SHIELDED 4 COND. #16AWG		X
3	1	RPC-27	PCB ASSY., EEH 4-20 MA		
2	1	RPC-26R	PCB ASSY., EEH 12CH MOTHERBD		
1	1	TCBx-120V	ASSY., EYE HYE BARGRAPH	(SMALL OR LARGE)	

Figure 2

D.) CALIBRATION PROCEDURE

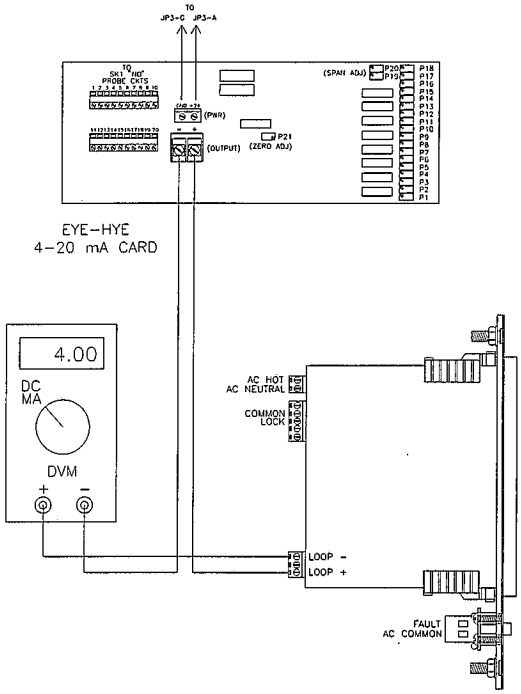


Figure 3

1.) Referring to Figure 3, connect a DVM in series with the 4-20 mA loop. Set the DVM to measure approximately 50 DC milliamps, (observe the meters polarity).
2.) Power-ON the entire Eye-Hye System and verify that all the configured relays are OFF, (matching the switch settings on the RECID-71 Input Exerciser).
3.) Using a small flat-head screwdriver, adjust potentiometer P21, "Zero", on the RPC-27 4-20 mA Output PCB assy., so that the DVM measures 3.85 DC mA.
4.) Energize the first probe with switch 1 on the RECID-71 exerciser. Adjust potentiometer P1 on the RPC-27 4-20 mA Output PCB assy. to read 4.00 mA on the DVM.
5.) Using the "Zero" button on the top left front of the bargraph, adjust the bargraph LED indicators to light just the bottom first LED segment. Note that each tap of the "Zero" button changes the top and bottom LED direction indicators and travel direction of the set level. Pressing and holding the "Zero" button allows for scale movement in the indicated direction. A less than ½ second tap of the "Zero" button just changes the direction.
6.) Using the RECID-71 Input Exerciser, sequentially energize the balance of the input/relays and calibrate the 4-20 mA output per the systems number of inputs and scaling, adjusting the appropriate Px potentiometer. The equation below can be used to figure the 4-20 mA output for the appropriate sequenced probe/relay input. Refer to Figure 4.

    a.) DC mA(probe x) = 4.0 + [16(x-1) /(Pt-1)]
    where: x = Sequential probe number starting from the bottom that is activated and
    Pt = Total number of probes in system.

7.) After adjusting the last potentiometer for 20 mA with all the probe inputs activated, set the full scale value for the bargraph by pressing the "Span" button on the top front of the bargraph. Adjust the scale upward till the top LED indicator lights, lighting all the LED indicators on the scale. The "Span" button works the same way as the "Zero" button. Tapping it changes direction and holding it makes the adjustment.

8.) The bargraph is now calibrated. Check a couple of different levels and verify the readings against the measured and calculated values.

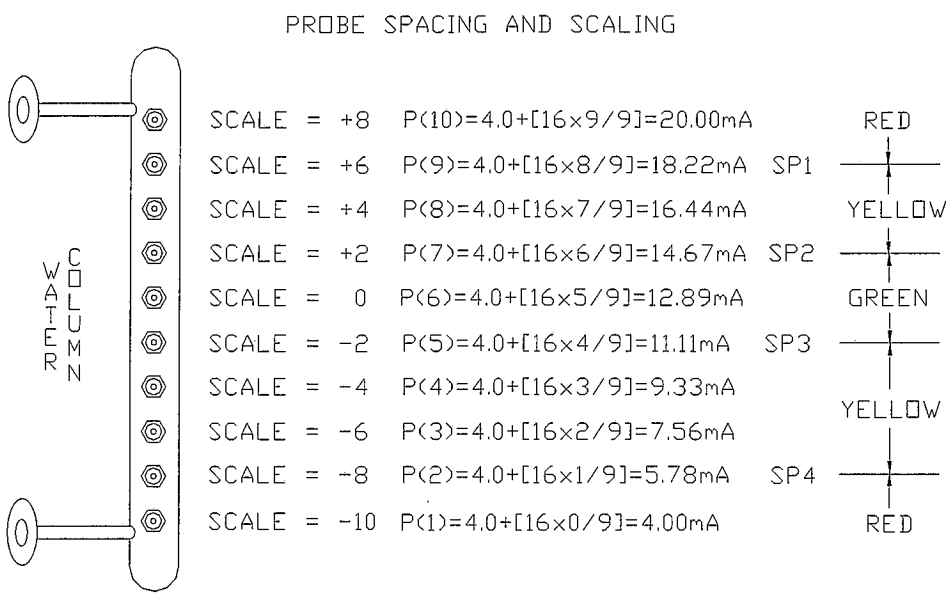


Figure 4

9.) NOTES:

a.) A valid reading for the 4-20 output is between 4 -20 mA inclusive, meaning water is sensed between the extreme probe locations. Anything else is under/over range. A reading less than 4.00 mA implies that the column is empty in its probe region, (no probes active). A reading of 20.0 mA implies that the column is full to the top probe or higher, (an output greater than 20.0 mA is not possible).

b.) Using the calibration equations from section D6 "normalizes" the current values of the RPC-27's output to the probe positions on the column. Actual quantitative customer scale values, linear or not, are represented by the current values. If other receiving devices are in the loop, their particular calibration procedures will need to be implemented, particularly if the scaling is non-linear, (needing a point to point calibration).

c.) The current output of the RPC-27 4-20 PCB is stepped among sequentially actuated probes. No proportionalizing of the current output is performed for areas between probes, (i.e. a reading of 4.00 mA for an activated bottom probe, water just above it, is the same reading for an un-activated second probe, with water just below it). The reading indicates at water level at the respective probe up to but, not activating or over the next higher probe.

d.) A record of the calibration values should be retained for future calibration verification and/or changes in the loop instrumentation.

e.) The User may want to secure the calibration of the system by locking further calibration changes, (bear in mind that this will also lockout the adjusting of the set points). See section E10.

E.) OPERATION

Two other bargraph functions allow the user to set the (4) set points and change the bargraph color for each set point range. Set points allow the User to setup colored status indication for the measured level. These (4) set points should be set up as follows, as the DEFAULT. Note there are no relay outputs for the Set Point levels and that they are only used to visually indicate status.

Zero to Set point 1 (Low Cut off) Red - 20% Full Scale,
Set point 1 to Set point 2 (Low) Yellow – 40% Full Scale,
Set point 2 to Set point 3 (Normal) Green – 60% Full Scale,
Set point 3 to Set point 4 (High) Yellow – 80% Full Scale, and
Set point 4 to Full scale (High High) Red

Setting the Set Points:

1.) Set Points are indicated by a lit LED indicator in an unlit measurements range or an unlit indicator in a lit measurement range.
2.) To set each Set Point, press the corresponding "SPx" button on the bottom of the front of the bargraph. It works just like the "Zero" and "Span" buttons, tapping it changes direction and holding it makes the adjustment.
3.) Adjust Set Points 1-4 to their corresponding DEFAULT values of 20, 40, 60, and 80% of the Full Scale.

Setting the Set Point Colors:

4.) Power down the bargraph for 5 or more seconds. While holding down all (4) of the "SPx" buttons, re-apply power. This enters the bargraph in the Color Set Mode.
5.) The LED indicators **will always be RED below Set Point 1**. To set the color to **Yellow above** Set Point **1**, hold the "**SP1**" button until the indicators **below** Set Point **1** are **Yellow** and then release.
6.) To set the color to **Green above** Set Point **2**, hold the "**SP2**" button until the indicators **below** Set Point **2** are **Green** and then release.
7.) To set the color to **Yellow above** Set Point **3**, hold the "**SP3**" button until the indicators **below** Set Point **3** are **Yellow** and then release.
8.) To set the color to **Red above** Set Point **4**, hold the "**SP4**" button until the indicators **below** Set Point **4** are **Red** and then release.
9.) To exit the Color Set Mode, power down the bargraph for 5 or more seconds and then re-apply power.

Calibration and Set Point Lockout:

10.) Modification of the Calibration and Set Point levels can be locked out by connecting a jumper between 19 and 20, (Lock and Common respectfully), on the 5 pin removable connector on the rear of the bargraph. Modifications are again executable by removing the jumper.

Bargraph Dimming:

11.) The brightness of the bargraph indicator can be halved by connecting a jumper between 20 and 21, (Common and Dim respectfully), on the 5 pin removable connector on the rear of the bargraph.

Out of Range Indication:

12.) Under range, less than a 4.0 mA input, is indicated by the flashing of the lowest single LED bargraph segment. Over range, more than a 20.0 mA input, is indicated by all the LED segments of the bargraph flashing.

F.) MULTIPLE USE OF BARGRAPHS

Multiple, (3 maximum), RTCBx-120V bargraph assemblies can be ran in-series from one Eye-Hye RPC-27 4-20 mA PCB assembly. Additional bargraph 4-20 mA inputs are connected in-series by observing their polarity and their Fault indicator inputs are connected in parallel as illustrated in Figure 6.

Calibration of multiple bargraphs is performed the same as for a single unit. What ever operation is done to one, is then sequentially done to the next.

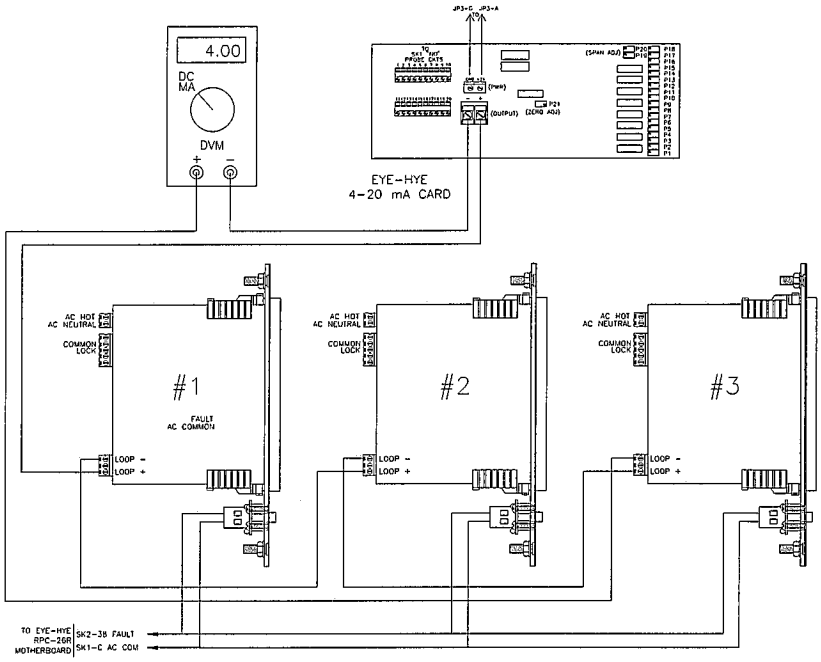


Figure 5

NOTE: In some instances of running (3) series bargraphs from a single RPC-27 4-20 mA PCB assembly, the full scale output may not be able to source the full 20 mA, (adjustment of its highest configured potentiometer, Px, will not electronically reach 20 mA). This is caused by the total load impedance of the bargraphs exceeding the driving power of the RPC-27 or exceeding its impedance vs. compliance voltage. In this case, simply note the highest value it will source and subtract a small amount to allow for over scale indication. Then use this value as your full scale calibration value instead of 20 mA. To keep all readings linear, use the difference of this value and 20mA subtracted from 16 in place of 16 in the equations of section D5a and b.

Also, the RTCBS-120V and RTCBL-120V, small and large respectfully, bargraphs can be used within the same RPC-27 output loop, (not exceeding 3 total bargraphs). Additional features and procedures require review when using a RTCBL-120V. See document SK1043 for this additional information.

NOTE: With 2 or less bargraphs in a single loop, an additional 4-20 mA receiving device may be added in-series with the loop, (provided it has a low input impedance, less than a couple of hundred ohms, like a panel meter). Additional devices with (3) bargraphs is not recommended.

G.) FAULT INDICATION WIRING AND TESTING

When properly configured, the Red LED on the Fault indicator lights when a "water over steam" condition, (out of sequence activation of probes from the bottom of the column), is detected by the Eye-Hye's RECID-69/70 Fault Indicator PCB assembly. A relay on the RECID-69-70 PCB closes sending 24 Vac to the bargraph's Fault Indication PCB where it is rectified and current limited to light the Red LED. See Figures 2 and 4 for proper wiring of the Fault Indicator PCB to the Eye-Hye's RPC-26R motherboard.

Note the additional jumper that is required between the SK1-A and SK2-37 terminals of the RPC-26R Motherboard to complete the ac fault circuit. Using the RECID-71 System Exerciser, an out of sequence relay activation can be initiated to test the circuits and the appropriate LED lit response.

H.) FIELD INSTALLATION

The following notes apply to field installation of the RTCBS-120V bargraph assembly.

1.) The complete assembly can be mounted in a control panel or enclosure up to ½ inch thick per the cutout information in Figure 1. Outdoor installations should meet or exceed a NEMA 4X or IP 65/66 enclosure requirements.
2.) The cable connecting the Eye-Hye to any RTCBS-120V is customer supplied due to the unknown distances. A industrial grade cable containing a minimum #16 AWG 4-conductor or (2) twisted pairs is recommended.. A maximum distance of 3000 feet between the Eye-Hye and RTCBS-120V is recommended. Shielded cable is recommended for distances over a hundred feet or in electrically noisy environments. The shield connection should be earth grounded, (not signal grounded), at the Eye-Hye end only. The material of the cables outer jacket should be specified to meet the conditions of the runs environment, (chemical/solvent/oil, temperature, ultra-violet, weather, underground, moisture, etc. exposures).
3.) General wiring practices of "running" separate paths, conduits, or troughs for signal/control cabling from power cabling is advised.
4.) Close access of 120/240 Vac 50/60 Hz. will need to be available to power the RTCBS-120V.
5.) Final calibration should be performed and verified in the final wired installation to insure accuracy.
6.) Any wiring or device changes to a calibrated loop will require re-calibration.

I.) TROUBLESHOOTING

Troubleshooting for encountered problems can be broken down into the following three separate subjects.

Bargraph Calibration:

1.) Are all the series connections made and properly polarized between the RPC-27 and the bargraph(s)?
2.) Are the bargraph(s) independently powered by either 120 or 240 Vac?
3.) Is the DVM actually showing a 4-20 mA DC loop current?
4.) Has the Zero and Span calibration been performed properly?
5.) Are the probe inputs activating the proper relays?
6.) Are the relay outputs properly activating the RPC-27 inputs?
7.) Has the loop, (its devices or wiring), been modified since the last calibration?

Fault Indication:

8.) Are all the parallel connections made between the Eye-Hye and the Fault Indicator PCB input terminals?
9.) Is the additional jumper added between the SK1-A and SK2-37 terminals of the RPC-26R Motherboard?
10.) Is the RECID-69/70 Fault Detector PCB assembly properly setup and detecting a fault?

Bargraph Operation:

11.) Are the bargraph(s) independently powered by either 120 or 240 Vac?
12.) Has the Zero and Span calibration been performed properly?
13.) Are all the series connections made and properly polarized between the RPC-27 and the bargraph(s)?
14.) Are all the Set Points sequentially setup and not on top of each other?
15.) Have the bargraph range colors been setup properly?
16.) Is the Lockout jumper on the 5 position rear connector been removed before trying to modify the calibration or Set Points?
17.) Was the bargraph returned to the "RUN" mode by exiting the "Color Change" mode with a 5 second power cycle?