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CD20-SFA (115VAC) Sampler Drive

User Manual

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Description

The CD20-SFA 115VAC Control and Drive Assembly (Part No. 50132307668) is engineered specifically for use with the True-Cut C-Series sample probes. It comprises the following components:

- a motor speed control that provides pulse input (flow-proportional) control of the sample probe. When a “start” pulse is received at the CD20-SFA control card input, the probe is rotated 180 degrees to capture and discharge a single 1.5-ml isokinetic sample. On a horizontal line, the probe is stopped in the closed position, while on a vertical line, the probe is stopped in the open position. A probe failure alarm relay provides an output contact that is open as long as a sample has been taken within the alarm delay period set on the control card potentiometer. Alarm delays ranging from 6 seconds to 6 minutes can be set.
- a 9VDC gear motor with a gear ratio of 150:1
- a cam with two high points located opposite each other mounted on the gear motor output shaft.
- a proximity switch mounted in the hub assembly opposite the cam. When a high point on the cam is opposite the proximity switch, the PROX (“Hold”) LED will be illuminated. This signal indicates the sample probe is at the stop and “hold” position.
- a coupling, jam nut, and hub, which allow the CD20-SFA Control and Drive Assembly to be mounted directly to the C-Series sample probe. No brackets or supports are required, but they are advisable on pipelines with some vibrations.
- an explosion-proof housing encloses the complete assembly. Two ¾-in. NPT holes allow connection of the 115VAC line power and input pulse (for flow proportional sampling). A ½-in. breather plug is installed on one side of the enclosure, and a ½-in. conduit plug is installed on the opposite side of the enclosure.

Installation and Wiring

The CD20-SFA mounts directly to the C-Series sample probe via the DC-2 coupling. The DC-2 coupling should be hand-tightened only to ensure that the internal retaining ring is not pushed out of its groove. If the DC-2 coupling is over-tightened at the CD20-SFA hub, the motor shaft will not engage the DC-1 (not shown) coupling on the probe.

Use the following steps to install field wiring to the CD20-SFA-115VAC (Figure 1):

1. Connect 115VAC power to 1TB-1 and 1TB-2.
2. Connect the flow pulse input contact to 1TB-5 (signal) and 1TB-6 (common). If an open collector transistor driver is used, the collector must connect to 1TB-5 and the emitter must connect to 1TB-6.

Note—The pulse contact must be closed for at least 5 msec to produce a start pulse.

Note—If an electronic square wave is used, it must have a pulse amplitude of 12VDC. A 5VDC square wave will not work.

Connect the sample failure alarm relay contact to 1TB-3 and 1TB-4. The contact will remain open as long as sampling occurs within the alarm delay period. This contact is rated for 90VA resistive and 30VA inductive loads. It is suitable for use with 115VAC low current.

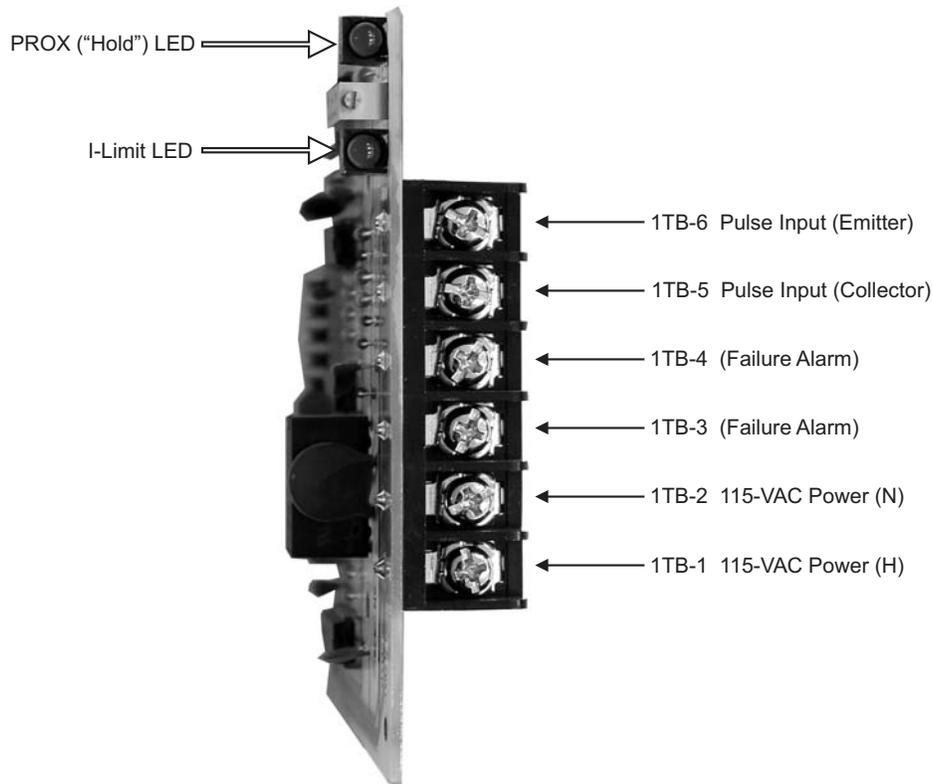


Figure 1—Field wiring of CD20-SFA (115VAC) assembly

Start-Up Procedure

The start-up procedure consists of four steps: a pretest, a repeat-mode checkout, an external input pulse mode checkout, and a sample probe/control drive checkout. Each of these is described below.

Pre-Test Procedure

1. Disconnect the CD20-SFA control and drive assembly from the sample probe.
2. Connect a pushbutton switch across 1TB-5 and 1TB-6 for test purposes.

Repeat Mode Check-Out

1. Apply 115VAC input power to the CD20-SFA.
2. Verify that the PROX (“Hold”) LED is on when the motor is not turning.
3. Close the switch across 1TB-5 and 1TB-6 to apply a pulse.
4. Verify that the output shaft turns in a CLOCKWISE (CW) direction as you look at the shaft. The sample probe will then be rotated COUNTERCLOCKWISE (CCW) when the CD20-SFA is connected to it. If the direction of motor rotation is wrong, swap the motor armature leads at 2TB-1 and 2TB-2.
5. Verify that the CD20-SFA output shaft rotates 180 degrees and stops after each switch closure input. It should take about 2.5 seconds for the motor to rotate 180 degrees and stop.

Note—Any switch closure made while the motor is turning is disregarded by the control.

6. Verify that the I-LIMIT LED blinks on momentarily during acceleration of the CD20-SFA motor. After the motor reaches the 16-18 rpm running speed, the I-LIMIT LED should turn off.

Note—The PROX (“Hold”) LED should be off while the motor is running and turned on when the motor stops.

7. Verify that the alarm relay contact is closed after power is applied, and that it opens after the alarm delay period has lapsed.

External Input Pulse Mode Check-Out

1. Disconnect the 115VAC input power from the CD20-SFA.
2. Remove the switch and wire in the external input pulse source.
3. Reapply 115VAC power to the CD20-SFA.
4. Verify that the CD20-SFA output shaft rotates 180 degrees for each external input pulse.

Note—Any internal coincidence pulses that provide the next “start” command for the CD20-SFA must occur when the CD20-SFA is stopped and the PROX (“Hold”) LED is on. The maximum valid flow proportional sampling rate is 2.5 seconds per sample (24 samples/min).

Sample Probe and CD20-SFA Check-Out

1. Disconnect VAC power from the CD20-SFA.
2. Mount the CD20-SFA to the sample probe and hand-tighten the DC-2 coupling.
3. Verify that the product line is full and pressurized.
4. Hold a 100-ml graduated beaker (or other applicable measuring device) under the probe’s discharge port and collect 10 samples. Each sample should be 1.5-ml in size; the total volume for 10 samples, therefore, should be 15 ml.

Motor Control Operation

The CD20-SFA motor control assembly consists of a control card and power board mounted to a ring which in turn is mounted to the back of the CD20-SFA gear motor. All field connections are to terminal block 1TB on the control card. The motor and proximity switch connections are made at the factory to terminal block 2TB on the power board.

Control Card Functions

The CD20-SFA control card performs the following functions:

- Components C7, R12, CR5, and a U4 gate provide a 100-msec power-up reset.
- An alarm delay timer circuit is implemented with U3, C6, C10, R4, R1 and a U4 gate. This circuit is reset every time a sample is taken and on initial power-up. U3 counts oscillator pulses and de-energizes relay 1CR after counting 2048 clock pulses from U4 pin 6. The alarm delay time is increased by adjusting R1 clockwise. Alarm delays ranging from 6 seconds to 6 minutes can be selected via R1.
- An input filter circuit connected to 1TB-5 buffers incoming pulses from an external flow measuring device. The filter has a 2msec time constant, and the input pulse duration must be at least 5 msec to assure a start pulse output.
- When set by a start pulse, the RUN/STOP latch U5A outputs the speed command voltage to the summing point control amplifier U2A.
- Amplifier U2B provides current feedback to the summing point control amplifier U2A.
- Resistor R19 provides armature voltage feedback to the summing point control amplifier U2A.

- DS2 is the current limit LED indicator.
- DS1 is the PROX (“Hold”) LED indicator.
- U2C is the proximity switch amplifier. The voltage across the proximity switch (2TB-3 to 2TB-4 on the power board) will be nominally +8VDC when the proximity switch is sensing metal and +4VDC when the proximity switch is sensing an absence of metal.
- Latch U5B outputs a single 20-msec one-shot pulse to reset the RUN/STOP latch U5A when the proximity switch first senses a high point on the cam.

Power Board Functions

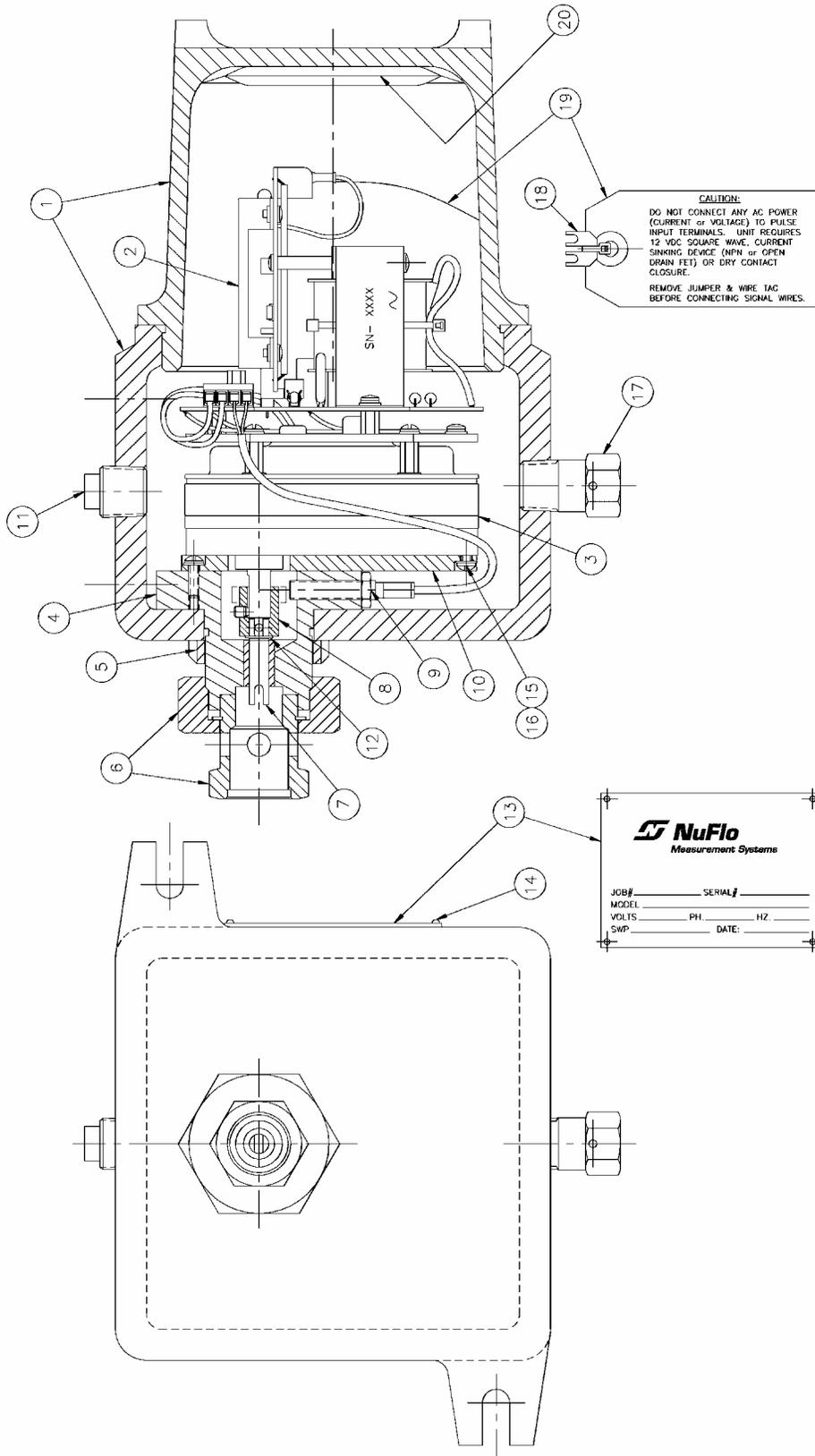
The CD20-SFA power board provides the following functions:

- Fuse F1 (2-amp, fast-acting) provides short circuit protection. ZD1, a 33V "crowbar" zener diode, provides over voltage protection for the rest of the circuit.
- Diode D2 prevents current flow if +115VAC power is connected to the common terminal and a ground is connected to the +115VAC terminal.
- Q4, an LT1074CT switching regulator and associated circuitry efficiently convert the +115VAC into a regulated +6.3VDC motor supply voltage.
- The control card uses motor armature feedback to set the speed command to the motor driver power FET Q2.
- A stop command from the control card to Q1 provides motor braking which prevents the motor from coasting past the stopping point.
- R6 is the motor current feedback resistor. The motor current is limited to 3.0 amps.
- Fuse F2 (2-amp, slow blow) will open in less than 1 minute if the motor is stalled (locked rotor).

Troubleshooting

| Problem | Probable Cause |
|--|---|
| Input power fuse F1 is open. | Input power surge above 33VDC. Short circuit on the power board. |
| Motor fuse F2 is open. | Motor stall (locked rotor). Short circuit in motor armature circuit. |
| Motor does not run and the current limit LED is off. | Input power not on or connected backwards. Fuse F1 or F2 open. Open circuit to motor armature. Check 2TB-1 and 2TB-2. CD20-SFA-115VAC control failure. No pulses of proper amplitude at 1TB-5 to 1TB-6. |
| Motor continues to run. The PROX ("Hold") LED never comes on or blinks on and off. | Broken or open proximity switch wire. Check at 2TB-3 and 2TB-4. The proximity switch is not sensing the high points of the cam due to misalignment. CD20-SFA-115VAC control failure (power supply board). |

CD20-SFA 115VAC Assembly (Part No. 50132307668)



CD20-SFA-115VAC Assembly (Part No. 50132307668) Parts List

| ITEM | QTY | CONTROL NO. | DESCRIPTION |
|------|-----|-------------|--|
| 1 | 1 | 50142304856 | ENCLOSURE |
| 2 | 1 | 50142307664 | SPEED CONTROL, 115VAC |
| 3 | 1 | 50142307700 | MOTOR, CS/CD DRIVE |
| 4 | 1 | 50142382006 | HUB ASSEMBLY, CD DRIVE |
| 5 | 1 | 50142200170 | JAM NUT, CS/CD DRIVE |
| 6 | 1 | 50142150932 | DRIVE COUPLING ASSY, DC-2 |
| 7 | 1 | 50142307695 | DRIVE SHAFT |
| 8 | 1 | 50142381667 | COUPLING, CAM/MOTOR ASSEMBLY |
| 9 | 1 | 50142309906 | PROXIMITY SWITCH, EI-08-01-NACS |
| 10 | 1 | 50142307686 | ADAPTER PLATE |
| 11 | 1 | 50142304632 | PLUG, 1/2", CONDUIT |
| 12 | 1 | 50142307696 | SNAP RING |
| 13 | 1 | 50142200101 | TAG, ELECTRICAL, CD/DS DRIVE |
| 14 | 4 | 50025400765 | DRIVE SCREW, 2 x 3/16" |
| 15 | 11 | 50142307693 | BINDER HD SCREW, #8-32NC x 1/2" LG |
| 16 | 11 | 50142307694 | WASHER HUB SCREW, #8 |
| 17 | 1 | 50142304642 | BREATHER, 1/2" PLUG |
| 18 | 1 | 50142400194 | JUMPER, RDI #J4-02 |
| 19 | 1 | 50142200109 | CAUTION TAG, CD20-SFA, CD20-SFA, CD30 DRIVES |
| 20 | 1 | 50142304858 | HUMISORB PACKET, #107HX 4 x 4 |

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