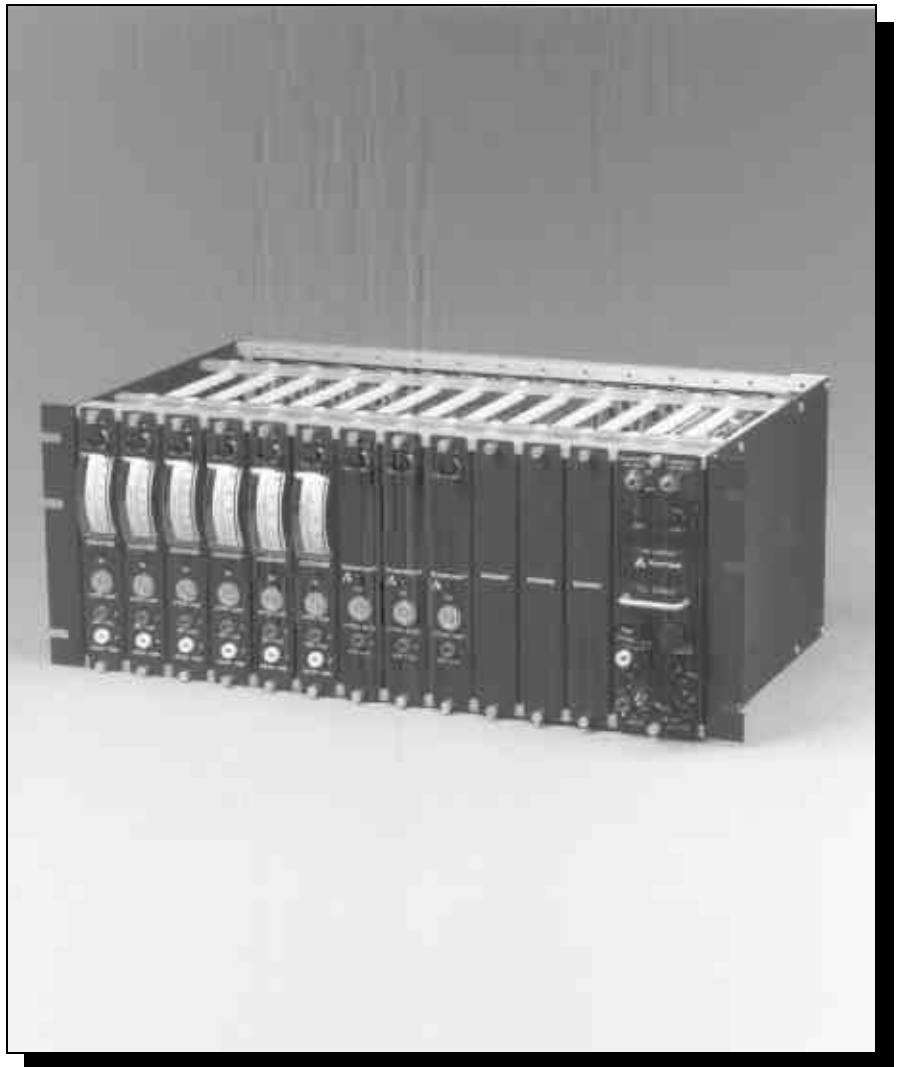


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Rev. AB

Model 710DU Trip/Calibration System



ROSEMOUNT[®] NUCLEAR

FISHER-ROSEMOUNT[®] Managing The Process Better.™

- *Qualified per IEEE Std 323-1974 and IEEE Std 344-1975*
- *Use with 4–20 transmitters or 3-wire 100 Ω platinum RTD's*
- *Exceptional reliable modular design*
- *Up to 8 precision trip points per signal*

FEATURES

Rosemount® Model 710DU Trip/Calibration Systems continuously monitor critical process parameters and provide highly accurate alarm action. As many as eight precision-calibrated trip points can be assigned to a single sensor channel. Any trip point can be quickly verified or changed.

The system consists of a card file with a plug-in calibration unit and space for up to 12 interchangeable trip unit modules. These features make Model 710DU Systems highly flexible, simple to install or reconfigure, and easy to calibrate.

OPERATION

Trip Unit

One master trip unit is required for each 4–20 mA transmitter or RTD input. A basic master trip unit displays the sensor output, provides one high or low trip circuit, a high/low gross failure circuit, and a proportional analog output for driving up to seven slave trip units.

Each slave adds one additional trip point and gross failure circuit to the transmitter loop. The trip output of any master or slave trip unit can drive an external relay. The auxiliary analog output of the master trip unit can be used to drive an external proportional controller or recorder.

The trip point circuit features precision external adjustment with either high or low nonlatching trip action. The gross failure circuits are internally adjustable with manual reset high and low trip action. Trip point and gross failure indicating lamps are furnished on each trip unit.



710-001AB

Calibration Unit

The trip point for any master or slave trip unit within the card file can be read or accurately calibrated by the calibration unit. This unit provides space for a unique digital readout assembly and permits the operator to automatically replace the field transmitter input signal to any channel with a precisely adjustable calibration signal. This enables the trip point to be compared exactly with the desired input signal level. After the trip points for all channels within the file have been set, the readout assembly can be removed and plugged into any other calibration unit.

Applications

Model 710DU trip/calibration systems are ideally suited to nuclear power applications or any process where frequent calibrations of trip points are essential. Critical process trip points are repeatable within 0.13% of span for 4–20 mA transmitter inputs and 0.75% of span for RTD inputs under normal conditions. System components have been qualified per IEEE Std 323-1974 and IEEE Std 344-1975 as stated in Rosemount Qualification Reports D8200037 and D8300112.

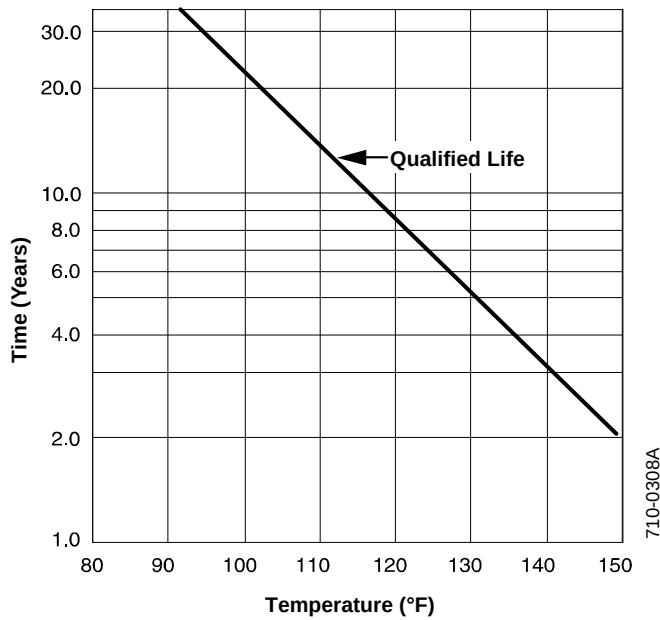


FIGURE 1. Qualified Life vs. Temperature.

Qualified Life

Qualified life is dependent on continuous ambient temperature at the installation site (see Figure 1) as well as the number of functional cycles. See Rosemount Qualification Report D8200037 for more detail regarding qualified life.

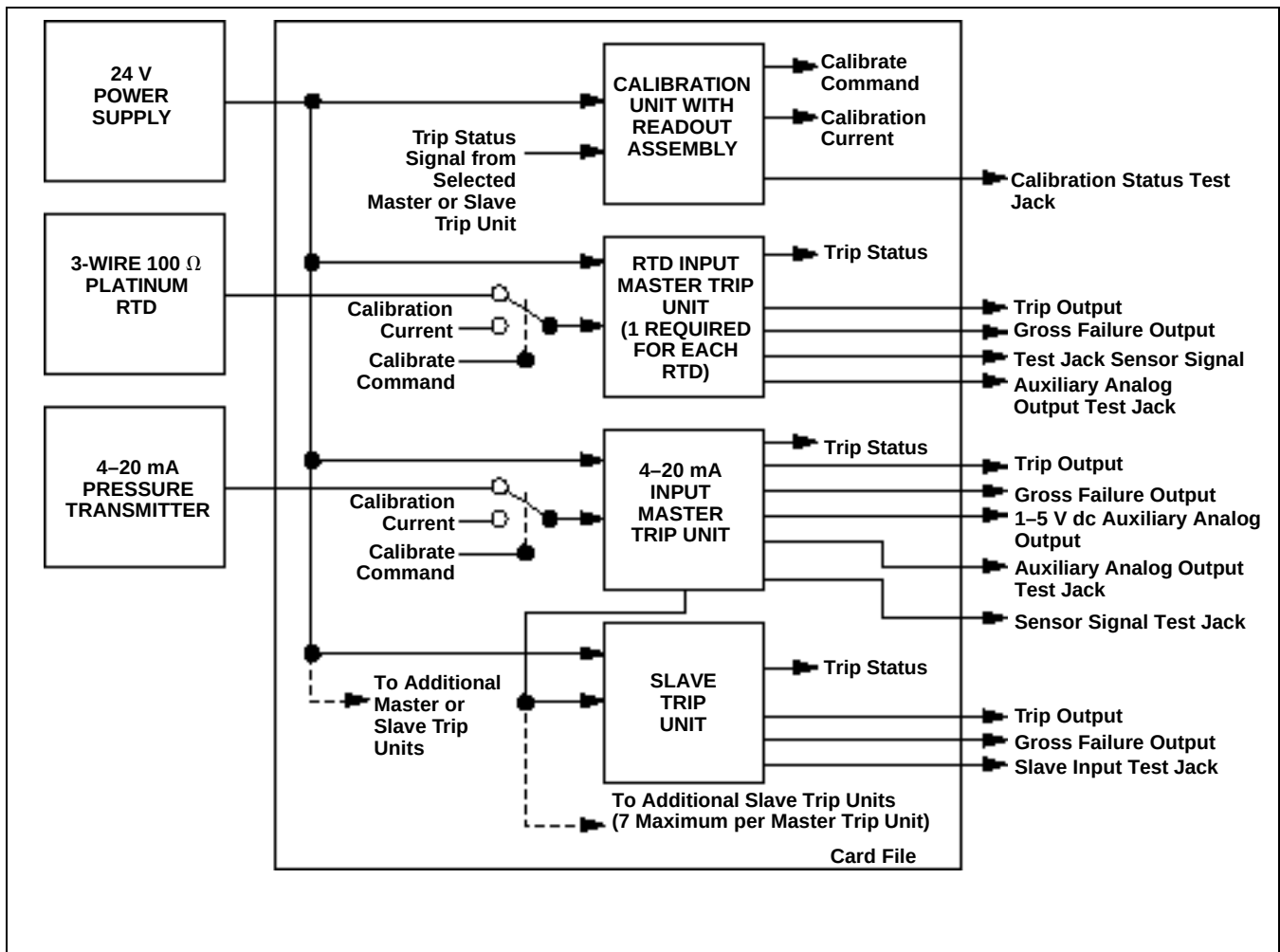


FIGURE 2. Model 710DU Trip/Calibration System Diagram.

TRIP UNIT CONFIGURATIONS

Master Trip Units

The master trip unit may be installed in any of the 12 card file positions. It provides an analog meter (scaled in °C, °F, %, GPM, etc.) to display the sensor signal. It also has one trip point and one gross failure output circuit.

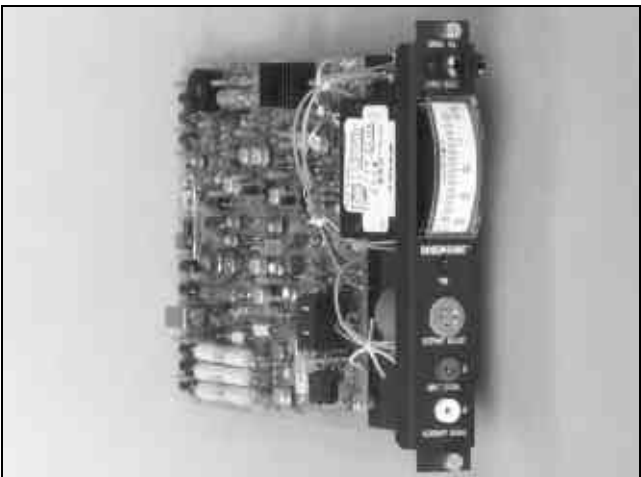
The trip point circuit has a 0–1 logic output signal (0–24 V dc) for driving an external relay. A precision adjustment screw is provided on the faceplate for setting the trip point signal level. Switches for selecting either a high or low trip action and a reset-differential adjustment for the nonlatching trip output are located on the circuit card.

The gross failure circuit provides a similar 0–1 logic output signal, but has internally adjustable set points for both high and low latching trip action.

Each master trip unit has a trip status output signal and an indicator lamp for the trip point, plus a gross failure lamp and gross failure reset switch. Both the trip output and gross failure output circuits can be used to drive independent external relays. Test jacks are also provided for monitoring the sensor input and auxiliary analog output signal.

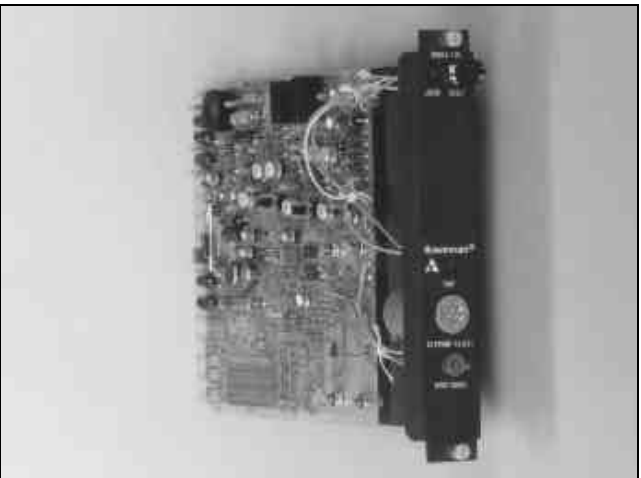
Slave Trip Units

Each slave trip unit adds one additional trip output circuit and one gross failure output circuit to any transmitter loop with a master trip unit. It has the same features as a master trip unit, except that it has no meter and no analog output.



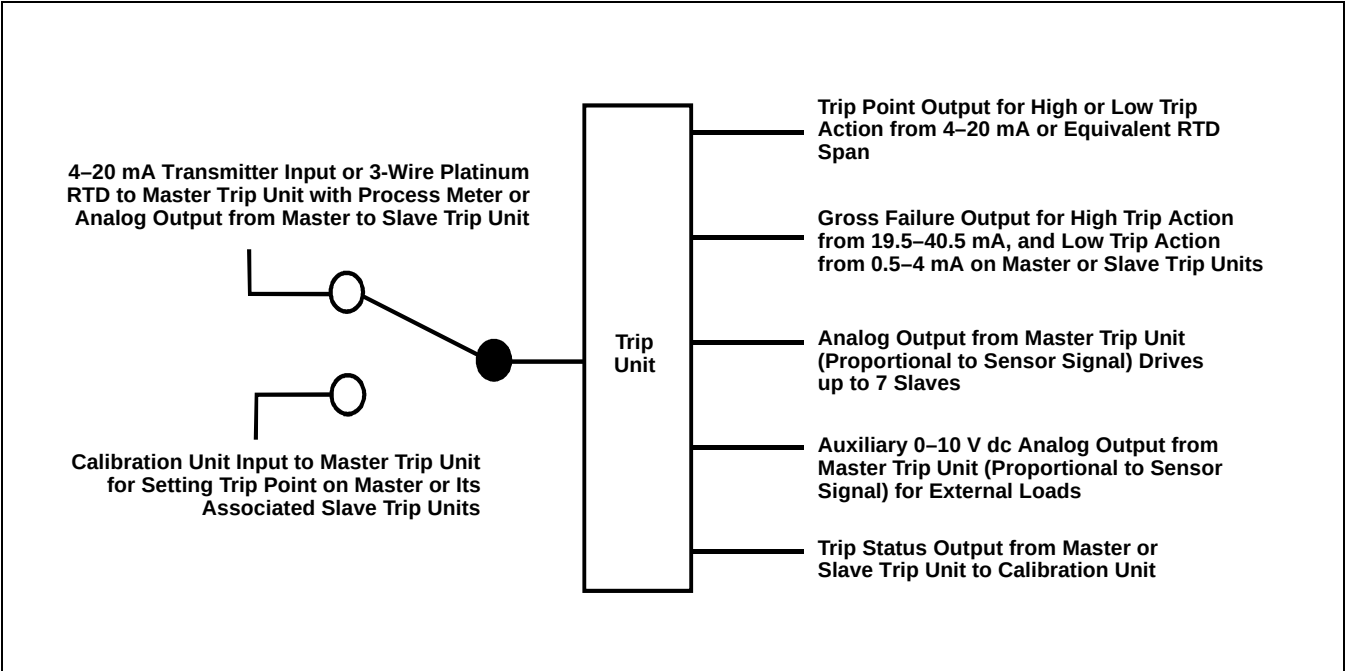
710-002AB

Master Trip Unit



710-003AB

Slave Trip Unit



710-0581B

FIGURE 3. Master or Slave Trip Unit Functions.

CALIBRATION UNIT AND READOUT

Calibration Unit

The calibration unit provides a rapid, precise means to check or adjust the trip point on any of the 12 channels in a card file. A removable readout assembly (interchangeable among all calibration units) gives high-resolution digital display of an adjustable calibration current, which replaces the transmitter input to any master trip unit selected. When output of the selected master or slave trip unit changes state, a second digital display latches and provides a precise readout of the calibration current level. A transient current can be added or subtracted with the stable current for checking the response time of externally driven equipment or for verifying gross failure set points. During calibration, the channel being tested is automatically placed in the gross failure mode.

The calibration unit has a power switch, transient current polarity switch, stable and transient current adjustments, and a selector switch for applying the calibration current to any master trip unit channel while reading the trip point of the master or its associated slaves. A calibration status signal (for remote display) and a lamp on the faceplate indicate that the system is in the calibration mode.

Test jacks are provided to monitor the time response of the user's system.

Readout Assembly

The digital readout assembly displays both calibration and trip current levels with 0.01 mA resolution. A trip status output signal from the master or slave trip unit latches the tracking trip current display. A trip status lamp and reset button are provided.



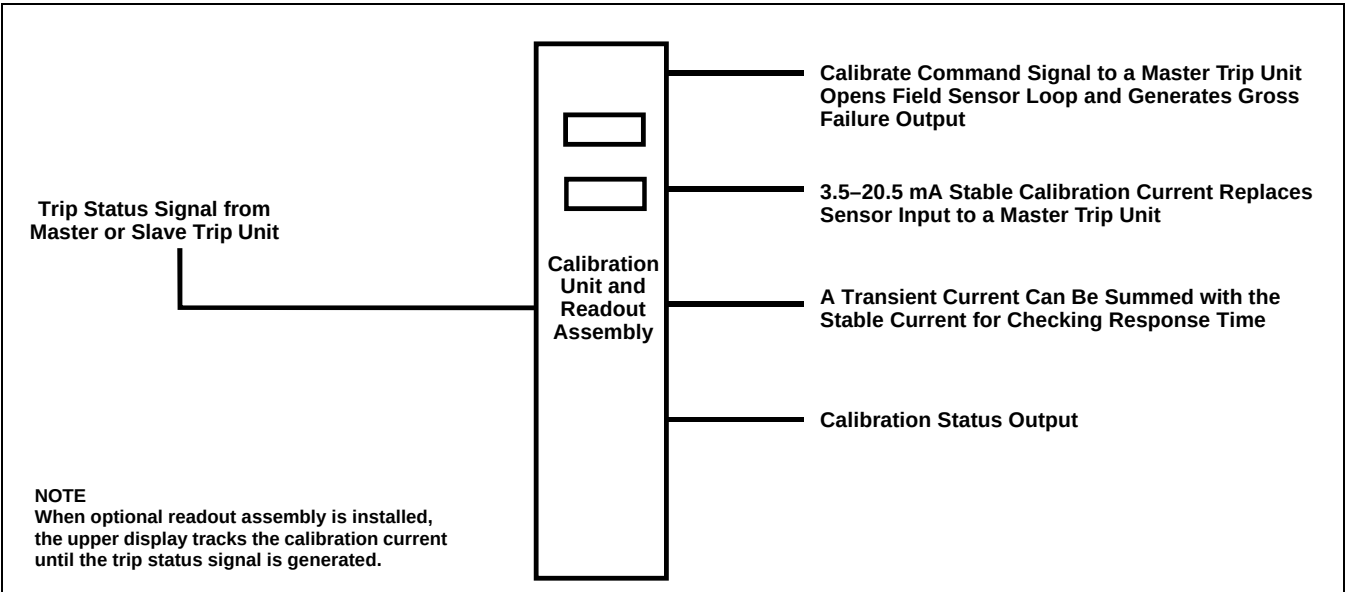
710-004AB

Calibration Unit



710-005AB

Readout Assembly



710-0581C

FIGURE 4. Calibration Unit Function.

SPECIFICATIONS

Electrical Specifications

Power Supply

24 V dc (nominal) power required

Inputs

2-wire 4–20 mA transmitters or 3-wire 100 Ω platinum RTD

Current Drain

Master trip unit is 260 mA; slave trip unit, calibration unit, and readout assembly are 225 mA each; and transmitter loop is limited to 100 mA.

Outputs

Independent 24 V dc signals for each trip output and each gross failure output circuit can drive external relays (24 Ω , minimum). Auxiliary 1–5 V dc analog signals (master trip units only) proportional to each sensor input can drive external loads (1500 Ω , minimum).

Trip Unit Adjustment and Controls

Trip Point

10-turn, screwdriver-slotted, precision wire-wound potentiometer on faceplate

Trip Reset Differential

Single-turn potentiometer on circuit card

Trip Logic

Switches on circuit card select trip output above or below trip current level and permit trip status lamp to be on or off in tripped mode

Gross Failure Limits

Single-turn potentiometers on circuit card for high and low current levels

Gross Failure Reset

Push-button switch resets gross failure circuit.

Frequency Response

Single-turn potentiometer on circuit card for 4–20 mA master trip unit

Zero and Span

25-turn, screwdriver-slotted, precision metal film potentiometer on circuit card (RTD master trip unit only)

Linearity

Single-turn potentiometer on circuit card (RTD master trip unit only)

Indicator LEDs

Trip status and gross failure LED on faceplate

Test Jacks

Signal input and auxiliary analog output voltages may be read with external meters on master trip units, and slave input signal on slave trip units.

Calibration Unit Adjustment and Controls

Power

On/off toggle switch for 24 V dc power to calibration unit and readout assembly

Transient Polarity

Positive/negative toggle switch for transient current

Transient Current

Single-turn, push/pull potentiometer sets and engages transient calibration current.

Stable Current

10-turn potentiometer adjusts current, which replaces sensor input to master trip unit

Channel Selector

Dual push/pull and rotary switch selects master trip unit channel, applies calibration current, and selects master or slave trip unit for trip current readout.

Digital Display

Readout assembly displays calibration current and trip current.

Display Reset

A trip current display reset button reverses the latching logic for the trip current display and trip status LED so trip current can be read for reversed trip status logic.

Indication

LED on calibration unit is lighted when system is in calibration mode. LED on readout assembly is lighted by trip status signal.

Test Jacks

Signal return, trip status output, and transient trigger may be monitored for time response measurements.

Performance Specifications

Trip Points

Adjustable from 4–20 mA ± 0.01 mA;
repeatable within 0.13% for 4–20 mA master trip
(0.20% for slave trip) and 0.75% for RTD master trip
(0.82% for slave trip) of calibrated span for 6 months
under normal conditions; reset differential
adjustable from 0.6 to 7.5% of span, or from 0.6 to
15% of span for the 15% reset differential option

Gross Failure Limits

Adjustable from 0.5–4 mA (low limit) and
19.5–40.5 mA (high limit)

Analog Meter

$\pm 3\%$ full-scale accuracy

Auxiliary Analog Output

0–10 V dc, accurate to within 0.15% of span of the
calibrated 1–5 V dc signal under normal conditions
(0.78% of span for RTD master trip); frequency
response adjustable from 0.8–8.0 Hz on 4–20 mA for
master trip units only.

Stable Current

3.50–20.50 mA ± 0.005 mA

Transient Current

0.50 to 20.50 mA ± 0.05 mA

Digital Readout

Display Accuracy:

00.00–20.00 ± 0.01 mA

20.01–30.00 ± 0.01 mA

30.01–45.00 ± 0.05 mA

Resolution:

0.01 mA

Power Supply Range

22–28 V dc

Physical Specifications

Card File Dimensions

19 in. W $\times$ 6^{31/32} in. H $\times$ 11 in. D

File Space

1.2-in. file centers for up to 12 master or slave trip
units plus a calibration unit; all units have captive
screws for securing to card file

Field Terminals

All connections are made to barrier strips on the rear of
the card file. Screw terminals are sized for #6 spade lugs.

Analog Indication

Master trip units have 1^{3/4}-in. vertical meters scaled
in appropriate engineering units.

Paint

Flat black with white letters, baked enamel paint

CARD FILE

The 710DU system card file is designed to
accommodate one plug-in calibration unit plus any
combination of up to 12 interchangeable, plug-in
master and slave trip units. Terminal strips on the rear
of the file are provided for all field wiring and master/
slave interconnections. The file fits a standard 19-in.
relay rack and has mounting provisions for installing a
tamper-proof bar over the set point adjustments on the
trip units. The unit is constructed so that a relay can be
tripped if a card is removed from the card file.

The Model 710DU trip/calibration systems are
furnished with all interconnecting wires between the
calibration unit and the master or slave trip units.

Accessory Extender Cards

Calibration, readout, and trip unit extender cards
are available to make all internal adjustments easily
accessible when frequent alteration of the system
configuration is necessary, or when troubleshooting
is required.

Bench Test Facility

The 710DU bench test facility is for calibration of
readout assemblies, troubleshooting faulty master
and slave trip units, and performing acceptance
tests. This test facility is intended to aid technicians
and is designed to operate from a 115 V ac or
230 V ac, 50–60 Hz power source.

ORDERING INFORMATION

Model	Product Description
710DU	Trip/Calibration System for Nuclear Applications, qualified per IEEE Std 323-1974 and IEEE Std 344-1975
Code	Option
0	Standard Unit
1	15% Reset Differential
Code	Assembly Description
TT	Master Trip Unit, 4–20 mA Input
TR	Master Trip Unit, RTD Input
TS	Slave Trip Unit
Code	Meter Option
XXXXX	Assigned by Rosemount for each Meter Scale Used on TT and TR Assemblies Only
Typical Model Number: 710DU 0 TR 74024	

Model	Product Description
710DU0	Trip/Calibration System for Nuclear Applications
Code	Assembly Description
CF	Card File
CL	Calibration Unit
RA1	Readout Assembly
BT	Blank Panel, Trip Unit
BC	Blank Panel, Calibration Unit
B1	Bench Test Facility (115 Vac Power)
B2	Bench Test Facility (230 Vac Power)
ET	Extender, Trip Unit
EC	Extender, Calibration Unit
ER	Extender, Readout Assembly
Typical Model Number: 710DU0 RA1	

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