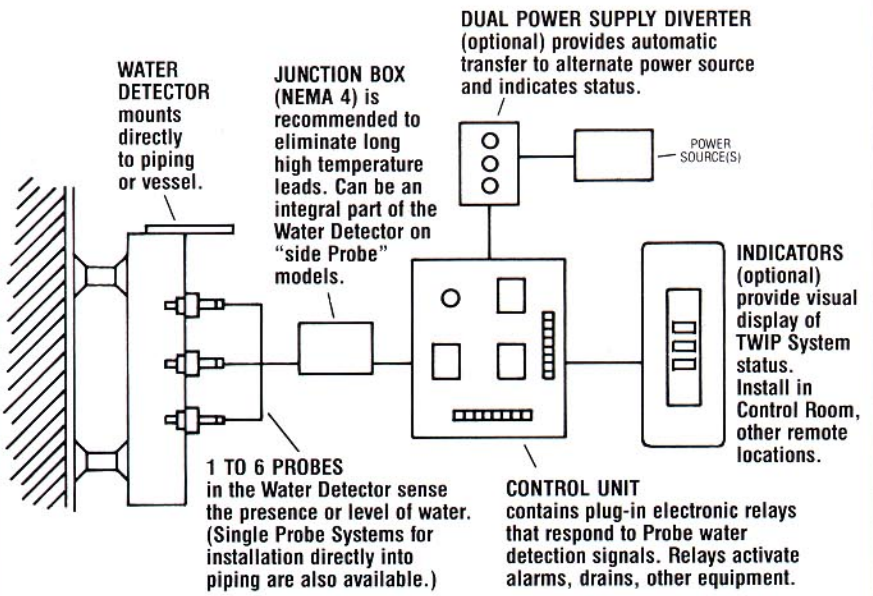
Clark·Reliance®

TWIP® SYSTEM

TURBINE WATER INDUCTION PROTECTION SYSTEM



THE CLARK-RELIANCE TWIP® SYSTEM
Simple • Versatile • Accurate • Reliable • Low Maintenance

Figure 1

Figure 3
WATER DETECTOR
An Independent Monitoring Chamber

Figure 4
CONDUCTIVITY PROBES
To Sense Presence Or Absence Of Water.

TWIP® SYSTEM DETECTION PROTECTS TURBINES FROM CATASTROPHIC DAMAGE CAUSED BY WATER INFLUX

The most effective protection against turbine water damage is a well designed steam plant. However, in the best of plants, the potential for disaster remains ever present. Industry research indicates a 35% probability of new equipment damage during the first five years of operation.

Abnormal conditions can arise quickly. Pump failures, valve failures, excessive condensation, site flooding and other events make every steam plant a possible candidate for swift and unexpected turbine damage.

Designing For Accuracy The ideal water detection device must fulfill multiple objectives. Foremost, false alarms are unacceptable. Equally undesired are the cost and nuisance of routine testing to assure proper equipment performance.

The TWIP System attacks these detection problems directly and effectively. TWIP combines industry's most successful sensing Probes with a choice of versatile, high technology equipment options. TWIP systems of proven reliability and accuracy are easily tailored for strategic location within any individual steam plant.

The utmost in performance is achieved in TWIP Systems using the optional "Voting Logic" trip circuit—employing a circuit logic in which any 2 of 3 designated probes will activate the trip circuit when water is present (Figure 2). Voting Logic virtually eliminates false trips caused by malfunctioning trip Probes – or a single level control failure.

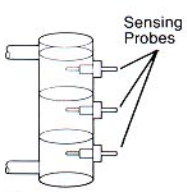


Figure 2
VOTING LOGIC PRINCIPLE AVOIDS FALSE ALARM TRIPS

As an option, two trip Probes can be installed in the Water Detector at the same level (trip point), to assure that even with voting logic circuitry, the trip point is always at the same single level (Figure 21).

TYPICAL POWER PLANT INSTALLATION LOCATIONS

Drain Pots • Deaerators • Flash Tanks • Feed Water Heaters • Boiler Drums • Water Columns • Storage Tanks • Blowdown Tanks • Separators • System Piping • Wherever Water Presence Must Be Known

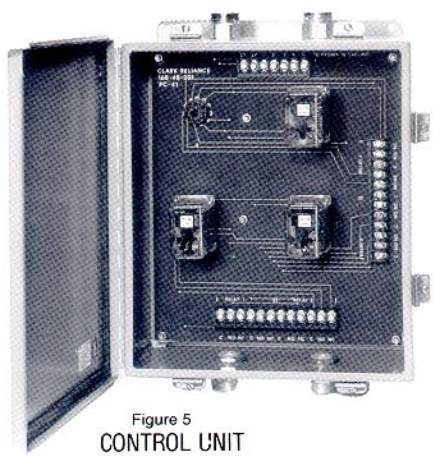


Figure 5
CONTROL UNIT
Responds To Probe Signals To Activate Indicator, Alarms, Trips, Other Protective Devices

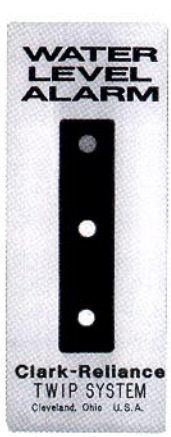


Figure 6
SUB-MINIATURE INDICATOR Offers Visual Awareness Of Presence Or Level Of Water (Optional)

WATER DETECTOR

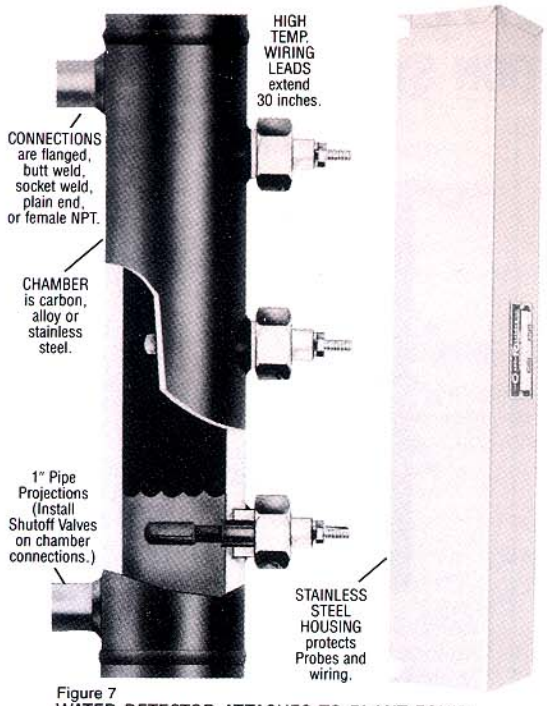


Figure 7
WATER DETECTOR ATTACHES TO PLANT EQUIPMENT, CONTAINS 1 TO 6 SENSING PROBES

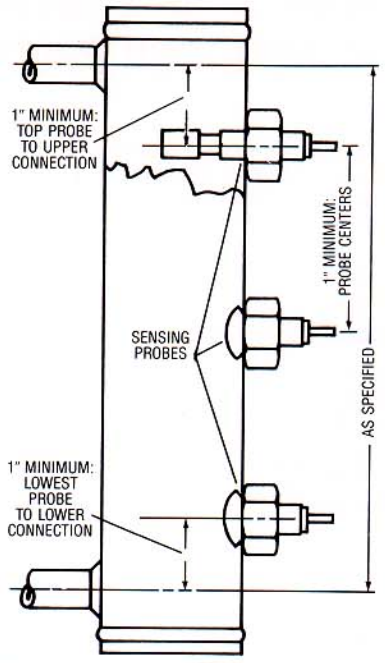


Figure 8
TYPICAL ARRANGEMENT AND DIMENSIONS FOR 3-PROBE WATER DETECTOR

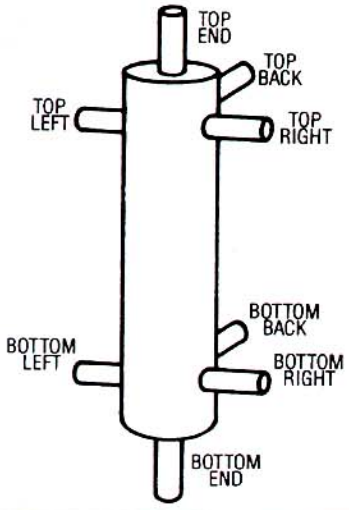


Figure 9
WATER DETECTOR CONNECTION OPTIONS
Choose any combination of two Water Detector connection locations shown below. Flanged, welded or screwed.

Performing as a small, independent chamber, the Water Detector is attached to steam plant equipment or piping.

To facilitate installation, connections may be of the size, type and orientation best suited to each application. The Water Detector is available in various materials to withstand system pressures to 3000 PSI and temperatures to 1100°F.

One or more sensing Probes are located at various chamber levels to signal the arrival or level of water within. Probes may be installed at whatever chamber locations are desired.

The Water Detector is where the TWIP system's liquid connections end – and advanced electronic operation begins.

Optional FLEXPAK® Jacket

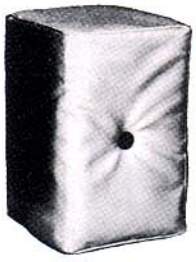


Figure 10
JACKET IMPROVES TWIP PERFORMANCE

For maximum system accuracy and personnel safety, the Water Detector should be insulated with the optional FLEXPAK jacket. The jacket provides a 2-inch thick insulation that is easily removed for routine equipment inspections. The jacket is suitable for outdoor service.

PROBES

Figure 11
MODEL T PROBE
To 450 PSI, 456°F., Teflon® Insulated

Figure 12
MODEL V PROBE
To 1000 PSI, 545°F., Teflon® Insulated

Figure 13
MODEL ZG PROBE
To 1500 PSI*, 900°F., Zirconium Oxide Insulated

Figure 14
MODEL FG PROBE
To 3000 PSI, 1100°F., Zirconium Oxide Insulated

Patented Probes: U.S. 4,507,521 – S.A. 83/664
U.K. 2,127,976 – Canada 1,200,283 – Others World-Wide

The performance reliability of the TWIP system is related directly to the exceptional success of Clark-Reliance Probes. Clark-Reliance pioneered Probe technology and now continues to lead in the innovative design and precision manufacture of water detecting Probes.

Located in the Water Detector, or acting as individual units in piping, sensing Probes complete an electrical circuit when water reaches the Probe tip. The completed circuit signals a relay in the Control Unit which, in turn, can activate an alarm, drain, pump or other equipment.

Clark-Reliance Probes allow even pure water of ultra-low conductivity (less than 1 micro mho) to complete electrical circuits.

ZG and FG Probe service life is extended with low cost Probe Repair Kits. Kits allow field replacement of components subject to normal wear factors.

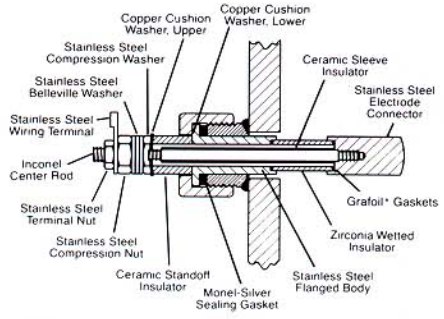


Figure 15
TWIP SYSTEM PROBES ARE MANUFACTURED FROM PREMIUM MATERIALS THROUGHOUT, PERMITTING A STANDARD WARRANTY OF 8,760 HOURS (ONE YEAR).

CONTROL UNIT

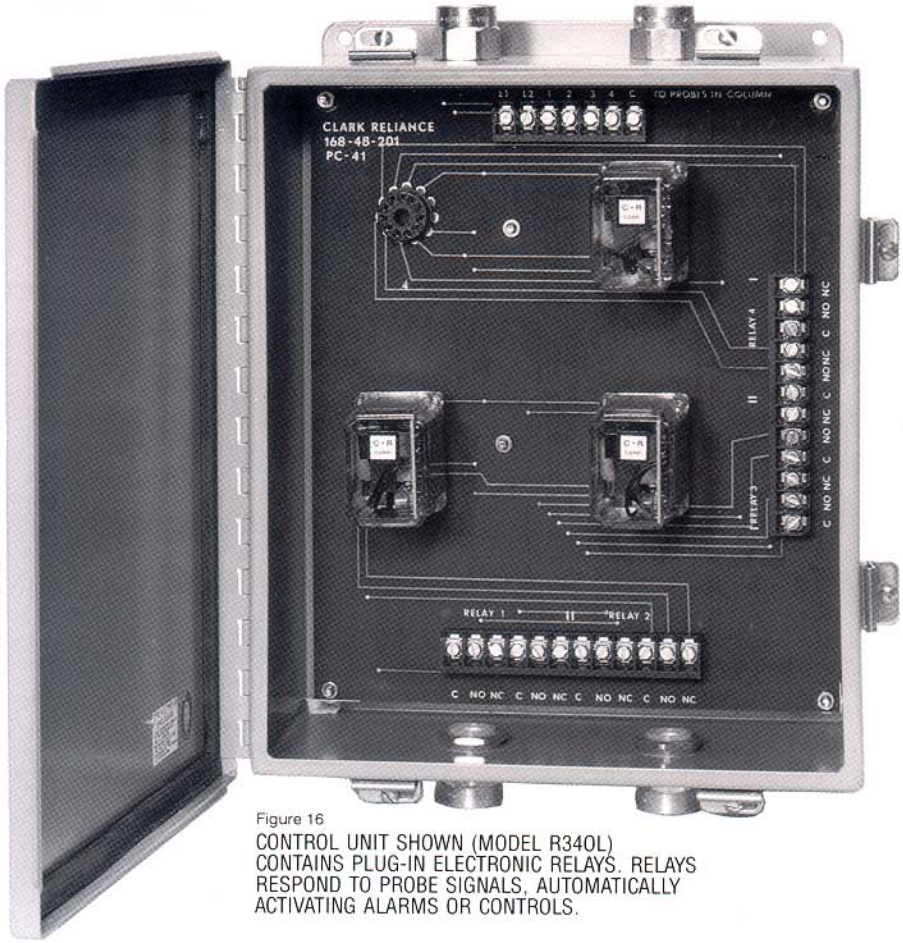


Figure 16
CONTROL UNIT SHOWN (MODEL R340L) CONTAINS PLUG-IN ELECTRONIC RELAYS. RELAYS RESPOND TO PROBE SIGNALS, AUTOMATICALLY ACTIVATING ALARMS OR CONTROLS.

TWIP Control Units, employing plug-in relays, printed circuit boards and other advanced componentry, are lightweight, compact and easily installed. Control Units may be located up to 1000 feet from the Water Detector.

In "direct mode" operation, water that contacts any sensing Probe immediately completes an electrical circuit to the Probe's corresponding relay in the Control Unit. The relay activates auxiliary functions such as indicators, solenoid valves, drain valves, audio/visual alarms, or other protective devices programmed to counteract or respond to the detection of unwanted water.

Relays may also work in an "inverse" mode, providing *de*-activation of electrical controls to prevent false signals during a power outage.

When water drops below the sensing Probe, the corresponding relay will revert to its prior state. Relays supply 12 VAC to Probes and require 115 VAC or 230 VAC 50/60 Hz line supply. Time delay is available upon request. Each control relay contains an LED to verify operational status.

TWIP CONTROL UNITS

MODEL NUMBER	RELAYS	ENCLOSURE	INDICATOR CIRCUIT*	FUNCTIONS
R110L	1	Nema 1	No	1
R140L	1	Nema 4	No	1
ECIL-1	1	Nema 1 or 4	Yes	1
R210L	2	Nema 1	No	2
R240L	2	Nema 4	No	2
ECIL-2	2	Nema 1 or 4	Yes	2
R310L	3	Nema 1	No	3
R340L	3	Nema 4	No	3
ECIL-3	3	Nema 1 or 4	Yes	3
R410L	4	Nema 1	No	4
R440L	4	Nema 4	No	4
ECIL-4	4	Nema 1 or 4	Yes	4
R510L	5	Nema 1	No	5
R540L	5	Nema 4	No	5
ECIL-5	5	Nema 1 or 4	Yes	5
R610L	6	Nema 1	No	6
R640L	6	Nema 4	No	6
ECIL-6	6	Nema 1 or 4	Yes	6

*Required for installations using optional indicator(s).

Figure 17

Optional Dual Power Supply Diverter

TWIP Control Units can be wired to operate from two power sources. Operation can switch automatically between power sources A and B in the event of outages.

ALARM INDICATOR (OPTIONAL)

SIZE: 3" WIDE, 7¾" HIGH

Figure 18
OPTIONAL MINIATURE INDICATORS CAN ALERT PERSONNEL TO PRESENCE OF UNWANTED WATER OR ACTUATION OF RELAYS

TWIP INDICATORS

MODEL NUMBER	STYLE	LIGHTS (RED-GREEN)	WIDTH (IN.)	HEIGHT (IN.)
MTI-1BT	Miniature	1 R-G	3.00	7.75
MTI-1T	Miniature	1 R	3.00	7.75
SMI-1BT	Sub-Min.	1 R-G	1.12	5.50
SMI-1T	Sub-Min.	1 R	1.12	5.50
MTI-2BT	Miniature	2 R-G	3.00	7.75
MTI-2T	Miniature	2 R	3.00	7.75
SMI-2BT	Sub-Min.	2 R-G	1.12	5.50
SMI-2T	Sub-Min.	2 R	1.12	5.50
MTI-3BT	Miniature	3 R-G	3.00	7.75
MTI-3T	Miniature	3 R	3.00	7.75
SMI-3BT	Sub-Min.	3 R-G	1.12	5.50
SMI-3T	Sub-Min.	3 R	1.12	5.50
MTI-4BT	Miniature	4 R-G	3.00	7.75
MTI-4T	Miniature	4 R	3.00	7.75
SMI-4BT	Sub-Min.	4 R-G	1.12	5.50
SMI-4T	Sub-Min.	4 R	1.12	5.50
MTI-5BT	Miniature	5 R-G	3.00	7.75
MTI-5T	Miniature	5 R	3.00	7.75
SMI-5BT	Sub-Min.	5 R-G	1.12	5.50
SMI-5T	Sub-Min.	5 R	1.12	5.50
MTI-6BT	Miniature	6 R-G	3.00	7.75
MTI-6T	Miniature	6 R	3.00	7.75
SMI-6BT	Sub-Min.	6 R-G	1.12	5.50
SMI-6T	Sub-Min.	6 R	1.12	5.50

TWIP Indicators employ panels of lights to show the presence of water – in a Water Detector chamber or at the location of a sensing Probe installed in plant piping. The Indicator may also be employed to show that a TWIP system relay has been activated.

Requiring only electrical connections, one or more Indicators may be quickly and easily installed in control rooms or other key locations throughout the plant.

Indicators use light emitting diodes (LEDs) which normally provide more than 10 years of service. LEDs are red or green.

TWIP® SYSTEM GENERAL SPECIFICATIONS

- TWIP Systems include the Water Detector, Water Detector Housing, Probe(s), Control Unit.
- Major options include the TWIP Indicators, Dual Power Supply Diverter, FLEXPAK Jacket, choice of NEMA Control Unit Enclosure, Integral Junction Box, plus electrical specifications as required.
- Water Detectors and Probes are available for pressures to 3000 PSI and temperatures to 1100°F. Water Detectors comply with ANSI B31.1 on request.
- Each Probe comes with a 30" high temperature lead. Use of 18 AWG silicone insulated wire is recommended for TWIP system on-site wiring.
- Relays are furnished for line voltage and frequency as specified. Switch contacts are UL rated at 5A/115 VAC, 8A/230 VAC and 1A/125VDC.

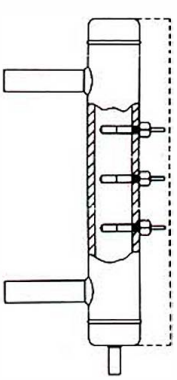
MODEL NUMBERING CODE
TURBINE WATER INDUCTION PROTECTION SYSTEM (TWIP®)

Below is an example of a typical model number which accurately designates a specific Clark-Reliance TWIP System.

Use this Model Numbering Code to determine the proper Model Number for your system and application requirements.

TD222F-3WP

"TWIP" ASSEMBLY	BODY STYLE:	BODY SIZE/TYPE:	MATERIAL (BODY, END CAPS, CONNECTIONS):	PROBE TYPE:	NUMBER OF PROBES IN BODY	(OPTION-WEATHERPROOF)
	1 - Not Applicable 2 - Side Probe(s) 3 - Top Probe(s) 4 - Top and Side Probe(s) 5 - Integral Ground Probe 6 - Side Probe(s) with Redundancy 7 - Top Probe(s) with Redundancy	1 - 2 1/2" Pipe XX Stg. (2 7/8" Dia.) 2 - 3" Pipe Sch. 160 (3 1/2" Dia.)* 3 - 5" Sch. 80 Pipe 4 - 5" Sch. 160 Pipe *ANSI B31.1 Compliance Requirement	1 - Carbon Steel 2 - 2 1/4% Chrome - 1% Moly. Steel 3 - 304 Type St. S. 4 - 316 Type St. S.	T - 450 PSI@ 456°F. Max. V - 1000 PSI@ 545°F. Max. Z - 1500 PSI*@ 900°F. Max. F - 3000 PSI@ 1100°F. Max. *"TWIP" Assemblies Only		



TYPICAL WATER DETECTOR TYPES**

Figure 19
Side Probes In Water Detector

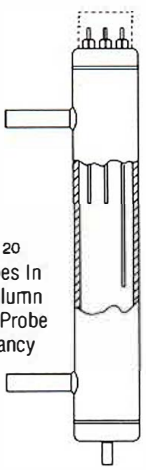


Figure 20
Top Probes In Water Column With Top Probe Redundancy

OPTIONAL EQUIPMENT:
SPECIFY WITH ORDER
- Visual Indicators, Type & Quantity
- FLEXPAK Insulating Jacket
- Dual Power Supply Diverter
- Control Enclosure: NEMA 1, 4, 4X, 12
- Integral Junction Box
- Inverse Mode Relays
- Time Delay Feature
- Voting Logic Circuit
- Supply Voltage

For additional information, contact your local Clark-Reliance representative

Clark·Reliance®

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