Queensland Urban Utilities

PRV154

Cordelia Street

Contract : **BW 70103-060**

Job Number : **43400306**

ELECTRICAL INSTALLATION

OPERATIONS and MAINTENANCE MANUAL

VOLUME 1

INSTALLATION BY:

SJ Electric (Qld) Pty Ltd
19 Elliot Street
Albion Qld 4010

Telephone: 07 3256 1522 Fax: 07 3256 1533

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1. General

1.1 General Workplace Health and Safety

- The Workplace Health and Safety Act (1995) sets out the laws about Workplace Health and Safety for all workplaces, workplace activities and specified high risk plant. The Electrical Safety Act (2002) sets out the laws covering electrical safety. Nothing in this document is designed, in any way, to undermine the authority of the Acts.
- All reasonable care must always be taken to ensure the plant is without risk to the health and safety of personnel operating and maintaining plant and equipment.
- Employers have an obligation to ensure the workplace health and safety of all personnel at work.
- It is employer responsibility to ensure that all persons entering or working on the premises use appropriate personal protective equipment.
- Personal protective equipment includes gloves, safety glasses, hard hats, ear protection, safe foot ware and, where necessary, specialist protective clothing for hazardous areas.
- Any item of equipment should always be isolated before maintenance or repairs commence to ensure that inadvertent operation of the item does not result in risk to the health and safety of any person.
- Where the item is isolated, any total or partial shutdown should not allow a hazardous situation to be created.
- Where the item cannot be isolated, another person should be stationed at the controls of the item and an effective means of direct communication should exist between the persons carrying out the maintenance and the person at the controls.

General Operating Principles

- All persons working the premises must be qualified Electrical Engineers or electrical trades persons capable of performing the required tasks competently. All personnel must also be familiar with plant and equipment.
- Adequate information, instruction, training and supervision must be provided to enable personnel to perform work without risk to health and safety.
- Work in an orderly way.
- Plan work in advance to avoid hazardous situations.
- Warn others of any hazards.
- Make inquiries before starting work, particularly on any unfamiliar installation or equipment.
- Before any work begins ensure that any instructions received or given are fully understood.
- Concentrate on the task on hand.
- Do not distract others or allow yourself to be distracted by foolish actions.
- Work from a safe and convenient position that provides a maximum working space that you do not have to over reach, you cannot slip, trip or stumble and so endanger yourself and others.
- Keep the working area tidy and free of unwanted materials and equipment.
- Use insulated tools where possible.
- Inspect tools and equipment regularly and ensure that any necessary maintenance is carried out.
- Keep yourself in good health.
- Do not work if ill or over tired, to the extent that your concentration, movement or alertness is affected. Illness or fatigue can endanger yourself and others.

1.2 Project Overview

Contract BW70103-060 was for the manufacture and testing of One (1) new solar powered switchboard to supply power to a QUU free issued PRV switchboard located at Cordelia St South Brisbane.

Equipment provided by SJ Electric ensures safe and efficient operation of the switchboard. Equipment supplied and installed by SJ Electric includes: -

- Switchboards
- Instrumentation
- Civil Works
- Pole mounted Solar Panel

The switchboard incorporates the latest technology in power monitoring, and instrumentation. It is important engineers, technicians and operators are familiar with the equipment installed before attempting any adjustments, modifications or maintenance.

The following Sections of this manual contain a comprehensive description of all equipment supplied, by SJ Electric. It is recommended that this manual be referred to before carrying out any work on any equipment.

1.3 Plant Maintenance

To ensure proper operation of the plant the following should be observed: -

- The plant should be kept clean and tidy at all times. Not only is this of aesthetic value, it extends equipment life.
- Check that all plant and equipment is operating correctly. Correctly operating equipment promotes overall plant efficiency.
- All items and areas of equipment should be hosed down and cleaned regularly.

WARNING

- **Avoid directly hosing <u>any</u> drive motor or electrical item.**

- All maintenance, service, modifications and significant deviations from Normal operating conditions should be recorded in the Plant Service Log
- After a month of operation, check the tension of all bolts associated with the plant and thereafter periodically. Bolted connections on painted surfaces can loosen due to thinning of the paint underneath the bolt head-bearing surface. Motor mounting bolts and other bolted connections subjected to vibration should be periodically checked for loosening.

WARNING

- **Before starting work on any item ensure that the power supply is isolated, tagged off, and the item cannot be started.**

- The importance of preventative maintenance cannot be over-emphasized. Regular maintenance and suitable care of the equipment will ensure a long and reliable service life of the equipment.
- Many stoppages can be avoided by following the recommended maintenance procedures. Do not wait until you hear the grinding of equipment that has broken down. If you see any item wearing down, replace it, before it causes damage to other associated items.

Preventive Maintenance

Maintenance procedures recommended to extend switchboard life are outlined as follows: -

- Switchboard exterior should be regularly wiped down with a solvent base cleaner such as “Spray & Wipe”. This will ensure longevity of the powder-coated surface.
- Accessible areas like distribution boards and motor starter panels should be cleaned with a vacuum cleaner to remove dust and foreign matter.
- PLC panels should be maintained as dust free as possible. Dusting with a dry rag is recommended - taking care not allows dust inside the I/O modules or processor.
- When removing or installing PLC modules care should be taken to ensure that power is turned off to the rack before modules are removed or installed.
- Connections and efficient operation of circuit breakers, contactors and isolators should be checked every 12 months - especially where connected to busbars.
- Busbar connections should be checked every 12 months.
- Globes for indicator lights should be checked on a weekly basis with any faulty lamps replaced.
- Cubicle Fans Filter should be inspected and cleaned frequently.

1.4 Electrical Control System

General Description

The switchboards are manufactured from 3mm aluminium and are suitable for location outdoors; the switchboards have been designed by Brisbane Water and contain several separate sections including:

- Incoming Section.
- Distribution Section.
- RTU Section.

1.5 Control and Monitoring System.

The control and monitoring of the system is performed by the Brisbane Water telemetry system and was not included in this contract.

2. Manufacturer’s Technical Data

2.1. Terasaki Circuit Breakers

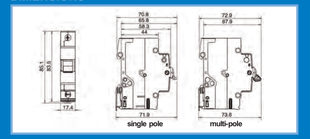
MINIATURE CIRCUIT BREAKERS

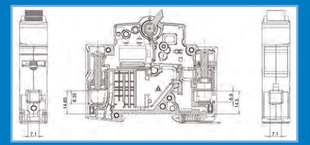
TD3 M06 6kA MCBs
Functions: **protection against overloads and short circuits, switching and isolation.**
Application: **in commercial and industrial electrical distribution systems.**

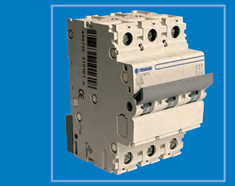
Breaking capacity: **Icn = 6kA to EN 60898. Certified by KEMA**
Voltage: **Un: 230 -240V AC phase-to-neutral, 400-415V AC phase-to-phase**
Pollution degree: **3**
Rigid conductor: **25mm2 maximum**
Flexible conductor: **16mm2 maximum**
Dual bottom terminal allows simultaneous connection of busbar and cable

	In (A) at 30˚C		
Poles	DIN Modules	B Type	C Type
1P	1	6-63	6-63
1P+N	2		6-63
2P	2	6-63	6-63
3P	3	6-63	6-63
3P+N	4		6-63
4P	4	6-63	6-63

DIMENSIONS





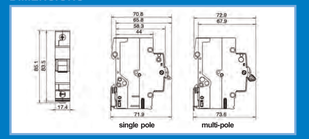


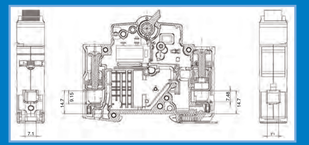
TD3 M10 10kA MCBs
Functions: **protection against overloads and short circuits, switching and isolation.**
Application: **in commercial and industrial electrical distribution systems.**

Breaking capacity: **Icn = 10kA to EN60898, Certified by KEMA Icu = 15kA to EN 60947-2**
Voltage: **Un: 230 -240V AC phase-to-neutral, 400-415V AC phase-to-phase**
Rigid conductor: **35mm2 maximum**
Flexible conductor: **25mm2 maximum**
Dual bottom terminal allows simultaneous connection of busbar and cable

	In (A) at 30˚C			
Poles	DIN Modules	B Type	C Type	D type
1P		16-63	2-63	1-63
1P+N	2		6-63	
2P	2	6-63	2-63	1-63
3P	3	6-63	2-63	1-63
3P+N	4		2-63	
4P	4	6-63	2-63	1-63

DIMENSIONS



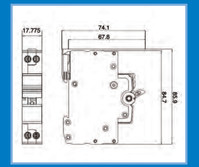


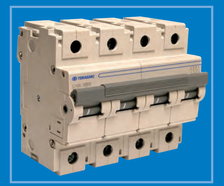
TD31P1M 1 pole + N in 1 module
Functions: **protection against overloads and short circuits, switching and isolation.**
Application: **single phase circuits where neutral must be switched.**

Breaking capacity: **Icn = 6kA to EN 60898**
Voltage: **Un: 240V AC**
Pollution degree: **2**
Rigid conductor: **16mm2 maximum**
Flexible conductor: **10mm2 maximum**

	In (A) at 30˚C		
Poles	DIN Modules	B Type	C Type
1P+N	1	6-40	6-40

DIMENSIONS



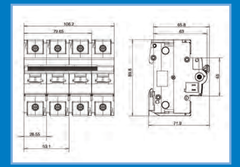


TD3 XA MCBs < 125A
Functions: **protection against overloads and short circuits, switching and isolation.**
Application: **to feed large loads or downstream distribution boards**

Breaking capacity: **Icn = 10kA to EN 60898**
Breaking capacity: **Icu = 10kA to EN 60947-2**
Voltage: **Un, 240V AC phase-to-neutral, 415V AC phase-to-phase**
Rigid conductor: **50mm2 maximum**
Flexible conductor: **35mm2 maximum**

	In (A) at 30˚C		
Poles	DIN Modules	B Type	C Type
1P	1.5	80, 100, 125	80, 100, 125
2P	3	80, 100, 125	80, 100, 125
3P	4.5	80, 100, 125	80, 100, 125
4P	6	80, 100, 125	80, 100, 125

DIMENSIONS

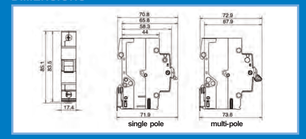


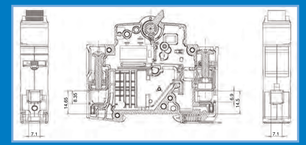
TD3 ICP
MINIATURE CIRCUIT BREAKERS FOR UTILITY SUPPLIES
Function: **protection against overloads and short-circuits. Switching and isolation.**
Application: **restriction of maximum current supplied to user by electricity utility company**

Standard: **UNE EN 20317**
Breaking Capacity: **6kA**
Voltage: **Un, 230 -240V AC phase-to-neutral, 400-415V AC phase-to-phase**
Rigid conductor: **25mm2 maximum**
Flexible conductor: **16mm2 maximum**
Dual bottom terminal allows simultaneous connection of busbar and cable

	In (A)	
Poles	DIN Modules	B Type
1P	1	5-63
1P+N	2	5-63
2P	2	5-63
3P	3	5-63
4P	4	5-63

DIMENSIONS





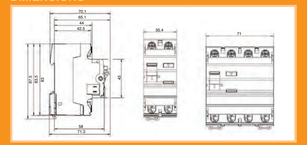
RESIDUAL CURRENT CIRCUIT BREAKERS

TD3RCCB
Function: **detection and interruption of earth leakage current**
Application: **protection from electric shock. Must be combined with an upstream device providing appropriate overload and short-circuit protection for the circuit.**

Standard: **EN 61008-1**
Voltage: **Un: 240V AC phase-to-neutral, 415V AC phase-to-phase**
Residual current breaking capacity: **Im = 1500A**
Rigid conductor: **25mm2 maximum**
Flexible conductor: **16mm2 maximum**

	In (A) at 30˚C		
Poles	DIN Modules	30mA	300mA
2P	2	25-63 types AC, A	25-63, type AC
4P	4	25-100 types AC, A	25-100 types AC, A AC-S

DIMENSIONS

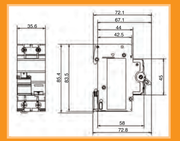


TD3RCBO Residual current circuit breaker with overload protection
Function: **detection and interruption of earth leakage current, overloads and short-circuits.**
Application: **commercial premises. Neutral conductor is switched on 2-module versions and unswitched on 1-module versions**

Breaking capacity Icn: **6kA (2P), 10kA (1P) to EN 61009-1**
Voltage: **Un: 240V AC**
Rigid conductor: **16mm2 maximum (1P), 25mm2 maximum (2P)**
Flexible conductor: **10mm2 maximum (1P), 16mm2 (2P)**

	In (A) at 30˚C	
DIN Modules	30mA	300mA
1	6-40, types B,C	
2	25-100 types AC, A, AC-S	25-100 types AC, A, AC-S

DIMENSIONS



MODULAR SWITCHES

TD3 MS
Function: **switching and isolation of circuits**
Application: **control systems, distribution systems**

Standard: **EN 60947-3**
Class: **AC 22**
Voltage: **Un, 240V AC phase-to-neutral, 415V AC phase-to-phase**
Rigid conductor: **16mm2 maximum (32A), 25mm2 maximum (63A), 50mm2 maximum (100A, 125A)**
Flexible conductor: **10mm2 maximum (32A), 16mm2 maximum (63A), 35mm2 maximum (100A, 125A)**

Poles	In (A)
1P	32, 63, 125
2P	63, 125
3P	63, 100*, 125*
4P	63, 100*, 125

*Available with red toggle

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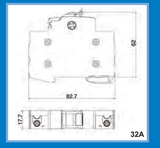
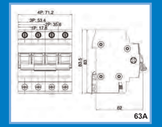
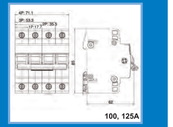
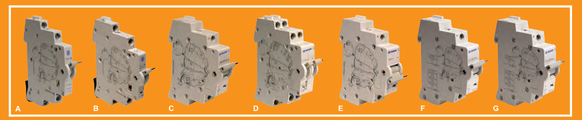






ACCESSORIES



Accessories for TD3 M06, TD3 M10, TD3 XA, TD3RCCB

A Auxiliary contact, 1NO, 1NC. 6A, 230V AC . Not suitable for TD3RCCB
B Alarm contact, 1NO, 1NC. 6A, 230V AC . Not suitable for TD3RCCB
C RCCB switch. Combined auxiliary contact (1NO, 1NC. 6A, 230V AC) + Alarm contact (1NO, 1NC. 6A, 230V AC)
D Shunt trip. RCCB switch (C) must be fitted before fitting the shunt trip to the TD3RCCB
E Undervoltage trip. RCCB switch (C) must be fitted before fitting the undervoltage trip to the TD3RCCB
G Overvoltage trip. Rated voltage, Un, 230V AC. Opens the circuit breaker if supply voltage exceeds 280V AC. RCCB switch (C) must be fitted before fitting the overvoltage trip to the TD3RCCB

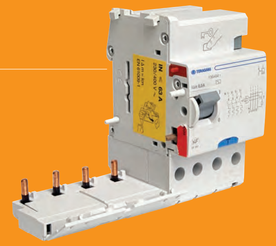
Accessory Combinations

TD3 M06, TD3 M10, TD3 XA: auxiliary contact + alarm contact + (shunt trip or undervoltage trip or overvoltage trip)
TD3RCCB: RCCB switch + (shunt trip or undervoltage trip or overvoltage trip)

Residual Current Block for TD3 M06, TD3 M10

Function: detection and interruption of earth leakage current
Application: Mechanically coupled to miniature circuit breaker

	In = 63A maximum		
DIN Modules	30mA	300mA	1000mA
2	2 Types AC, A	Types AC, A	
4	4 Types AC, A	Types AC, A	Types AC A, S



Padlock

Suitable for locking TD3 M06, TD3 M10, TD3 XA miniature circuit breakers in the open or closed positions. Suitable for locking TD31P1M miniature circuit breakers in the open position only. Accepts two padlocks with hasp diameter up to 4.75mm, or three padlocks with hasp diameter up to 3mm. The miniature circuit breaker may be mounted, or removed from the DIN rail with the padlock in position.

Handle for TD3 ICP

Rotary handle clips onto TD3 ICP miniature circuit breakers, and operates the device from outside the door.

Safety and protection are the prime purposes of Terasaki products. Our range of DIN Modular Protection products covers ratings from 0.5A to 125A and includes:

-Circuit breakers for overload and short-circuit protection
-Residual current devices for the prevention of electric shock and fires
-Circuit breakers combining overload, short-circuit and residual current protection

With more than 500 items in the range, there is a solution for most applications.

TERASAKI
Innovators in Protection Technology

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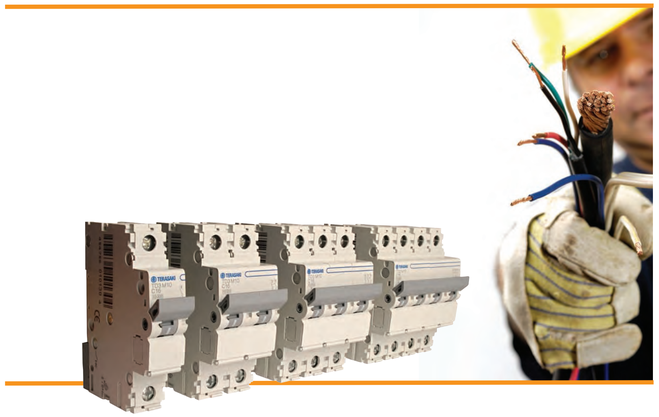


DIN Modular Protection

For Final Circuits in Industrial and Commercial Buildings

2.2. Sprecher and Schuh CA-7Contactors

sprecher+
schuh

Contact Block

Performance & Selection

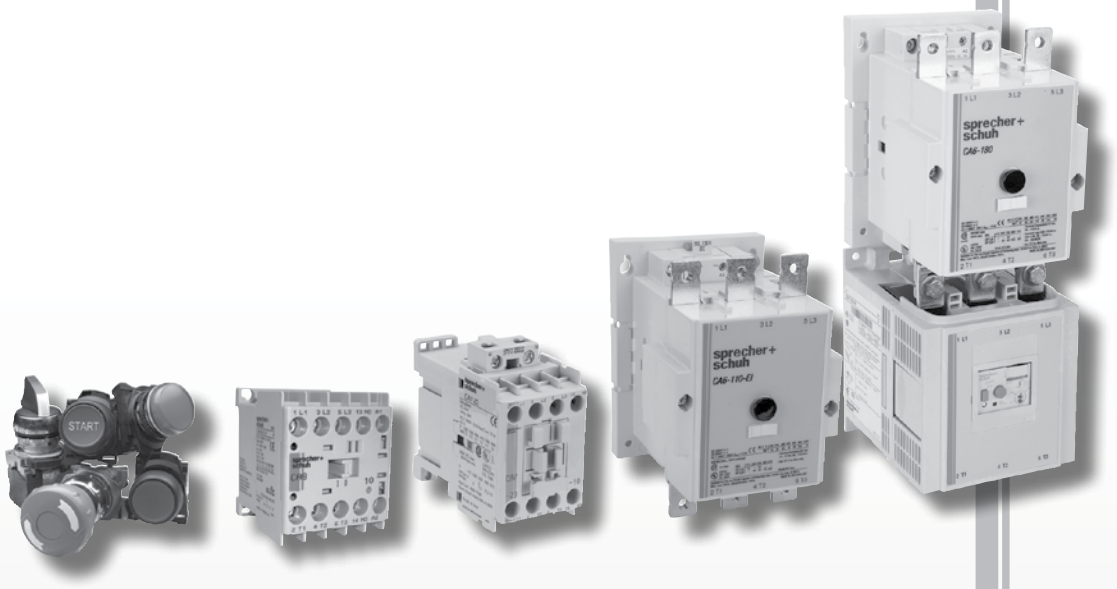


Table of Contents

A combination of many factors affect the dependability, life expectancy, and suitability of a contact block in any given application. Understanding the most important of those factors can help you select the best switch for your needs. In the pages that follow you'll gain a basic understanding of switch materials and properties, and how they affect switch performance.

Contact Material

The contact material forms the surfaces that come in contact with each other to establish an electrical circuit. Typical contact materials include fine silver, nickel-silver, and silver alloys. Fine silver provides low electrical resistance between the movable and stationary contact interface. Silver alloys form harder surfaces to reduce wear and help prevent contact welding.

In low voltage applications (below 48V DC and 0.1 A, or below 24V AC and 0.4 A) where excess oil or dust is present, the use of more noble alloys (such as palladium, gold, and their alloys) in the contact material is recommended. These alloys are highly reliable in this type of environment.

Silver alloys are susceptible to chemical attack which can affect reliability at low voltages. Noble metals resist chemical attack, but are susceptible to frictional polymer formation, which can affect reliability. Combining gold and palladium will resist frictional polymer formation.

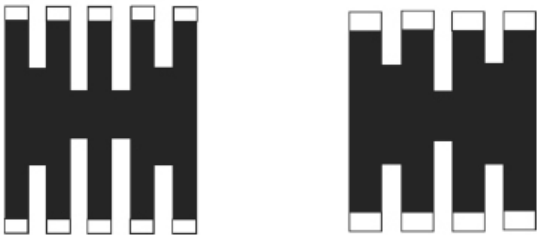
Contact Construction

The perimeter of the contact is often shaped like a circle or rectangle and may have little effect on contact performance. The shape of the faces where the fixed and movable contacts meet is more important. This interface should not have two flat surfaces meeting. If one of the contacts has a flat surface, the other contact should be a rounded surface to provide a more defined and controlled touch point.

Figure 1. Bifurcated Spanner Example

The bifurcated style of construction provides a higher degree of reliability than the butt spanner because it divides each movable contact into two sections at the tip of the spanner. This minimizes the chance of foreign materials accumulating on contact surfaces and preventing the completion of the circuit. Even if foreign material accumulates on one of the contact tips, the second tip will most likely touch a clean spot establishing the circuit. Typically, the bifurcated spanner is designed for use in full voltage applications, where the arc between the spanner and stationary contacts will burn off small amounts of contamination in most cases. To aid contact cleaning the contact spanner is designed to flex, which wipes the stationary surface and allows each finger to act independently.

Figure 2. Pentafurcated and Quadfurcated Spanner Examples



In low voltage applications (below 48V DC and 0.1 A or below 24V AC and 0.4 A) pentafurcated/quadfurcated styles of construction provide the highest degree of reliability because they divide each movable spanner contact side into separate flexible fingers. Every part in the system is corrosion-resistant and the flexible spanner is designed to wipe the stationary contacts clean every time the circuit is opened or closed. This is important since the absence of an arc in low voltage environments means that contaminants will not be burned off, but will be eliminated by the wiping action. Therefore, the pentafurcated or quadfurcated are the most reliable styles of spanners available.

Some manufacturers use protrusions such as bars or nibs raised on the face of either the movable or stationary contact to help establish the circuit under low power conditions. These raised surfaces will tend to penetrate non-conducting films that may be present on contact surfaces. They may also lessen the chance of foreign matter preventing completion of the circuit. Such protrusions may, however, quickly burn away under arcing or higher current conditions.

Base materials to which the contact material is attached include copper alloys and steel. Copper alloy is preferable because of its thermal conductivity, electrical conductivity, and corrosion properties.

Contact Size/ Volume — Stationary vs. Movable

Contact size refers to the size of the face of the contact or the areas that meet to form the interface between the movable and stationary contacts. Volume is the total amount of contact material.

It is desirable to make one of the contacts smaller than the other so it stays within the perimeter of the other contact when switch action takes place. This arrangement provides greater assurance that alignment of contacts is maintained under repeated operation and resulting wear. Misalignment can cause severe contact wear and shorten switch life.

In the contact set, the movable contact is most often the smaller contact in both size and volume, so that its mass and resulting inertia can be minimized. Partly because of its low volume, the movable contact operates at a higher temperature than the stationary contact. Consequently, the stationary contact will also contribute to a greater rate of wear on the movable contact. The stationary contact is generally attached to a more massive base structure that provides a better heat sink than the movable contact structure.

In alternating current applications, the higher temperature of the movable contact can cause material to be expelled from the surface of the contact. The higher temperature can cause transfer of material to the cooler surface of the stationary contact as well. In direct current applications, the relative polarity of the contacts has a major effect on how the contact material is transferred from one surface to the other.

Contact Reliability

Contact reliability pertains to the ability of contacts to establish a circuit across the interface between the stationary and movable contact set(s) each time the switch is operated. This reliability can be most often adversely affected by two conditions:

- Mechanical debris within the switch
- Non-conducting films that form on the contact surfaces

Mechanical debris or dirt can be introduced into the switch during assembly. Dirt and debris can also be interjected during installation or can be a product of switch action. The wear produced by internal switch components sliding past one another during operation can generate dirt. Care must be taken in the design of moving mechanisms to keep this wear to a minimum.

Non-conducting film and oxides can be formed from gaseous contaminants that enter the switch from an external environment as well as being formed from internally generated reactants. Sealing methods have been developed to isolate the switch interior from the external environment. An understanding of the relationship of all the material used in the construction of a switch is required to eliminate the internally generated reactants. This requires knowledge of the post curing outgassing of any plastics, elastomers, paint, and other components used in the construction of the system. Some gases will react in the presence of an electric arc to form non-conducting films that will cause reliability problems if deposited on the contact face. The tendency of many thermoset plastics to continue to outgas for a period of time after curing has led to the use of thermoplastic materials in switch interiors.

Contact Resistance

Contact resistance pertains to resistance across the interface between a pair of movable and stationary contacts. The higher the value of this resistance, the more difficult it is to establish a circuit when the contacts close. This is especially true in low power circuits. Higher resistance also contributes to contact heating.

The initial contact resistance of both fine silver contacts and noble contact materials (gold, palladium, and their alloys) is 10…15 milliohms. However, the resistance of noble contact materials will remain relatively constant during their lifetime compared to silver contacts, which typically increase over time. These resistance values could vary with the ambient conditions in the vicinity of the contacts themselves

Sealed switches have slightly higher initial contact resistances compared to silver contacts (80…150 milliohms, depending on type), but they remain stable over the life of the device.

In addition to the physical characteristics of the materials used in manufacturing, design considerations also affect the performance of a switching mechanism. In this section you'll gain an overview of those switch design fundamentals and how they affect switch performance.

Single Break vs. Double Break

Figure 3. Single Break Design

Figure 4. Double Break Design

Single break and double break refer to the number of contact pairs that are used to make or break the electrical circuit. Single break means the electrical circuit is controlled by one set of contacts. Double break means the electrical circuit is controlled by two sets of contacts in series.

In a single break design, the contact pair tends to repeatedly make and break the circuit on the same spot on the contact faces. This helps to keep the contact touch point clean, enhancing the contact reliability.

The double break design provides twice the length of air gap in the electrical circuit using the same stroke of the actuating member as with the single break design. The result is the electrical arc that is created by the opening of the circuit will be extinguished sooner and with less actuator movement as compared to a single break design.

Also, since the energy in the arc created upon contact opening is distributed across two air gaps, there is less tendency for the contacts to weld in the double break design.

On the other hand, because of the nature of the double break design, the contact points of the spanner may vary slightly with each actuation. This variation may, over time, affect switch reliability.

Contact Motion

Contact motion refers to the relative motion of the contact faces as they begin to touch one another. Various design techniques are utilized to increase the reliability of the contacts establishing the circuit as they meet.

A wiping or sliding action will help clear surfaces of dirt and oxides and break any nonconducting film that may have formed on contact surfaces. This type of action must be carefully controlled, especially with precious metal contacts, to avoid excessive mechanical wear of the contacts.

Contact tips on the end of the spanner must be capable of flexing and twisting to establish a seat on the surfaces of bifurcated/quadfurcated/pentafurcated stationary contacts. A sliding action of one contact against the other could cause continuity interruptions if the moving contact slides up over a piece of debris.

Spring Force

The spring force discussed in the following paragraphs is the force provided within the contact block that returns the contact structure to its normal or unoperated state when the external force applied to the device operator is removed. This force holds the contact structure in its normal state until an external force is again applied to the device operator.

The amount of spring force is determined by the force required to insure contact reliability under the conditions in a variety of applications. Sufficient force is required to break through contaminants that may be present on the contact faces on the normally closed (N.C.) contacts. The force should insure that contacts stay stable under possible shock and vibration. Light welds created by contact arcing on the normally open (N.O.) contacts should be able to be broken by spring force. The spring force required to maintain circuit reliability is dependant on the contact material hardness. Greater force is required for harder materials.

Spring force directly affects the external force required to operate and to some extent contribute to internal switch friction. Consideration must be given to these factors when determining the spring force used.

Overtravel

Overtravel in a switch pertains to the amount of travel occurring in a switch beyond what is required to operate. Overtravel allows for wear within the switch mechanism. It helps to insure the switch will continue to function as the contacts wear or erode. Overtravel also provides contact stabilization under conditions of shock and vibration.

Contact Underlap vs. Contact Overlap

Contact underlap and overlap refer to the relative action of the N.O. and N.C. contacts when the switch is actuated.

Underlap is the more common type of switch action. As the device operator is moved from its rest position to initiate switch action, the following events take place in order:

1. The N.C. contact opens.
2. There is a duration where no electrical continuity is present.
3. The N.O. contact closes.

In overlap type switch action, the N.O. contact makes its circuit before the N.C. contact breaks its circuit. There is never a period of time when electrical continuity is absent:

1. The N.O. contact closes.
2. There is a duration where both circuits are active.
3. The N.C. contact opens.

The type of switch action selected is dependant on the requirements of the specific user circuit application.

Direct Drive

NFPA 79 and EN 418 both require that emergency stops must be a direct drive design. A direct drive design switch will have continuous mechanical linkage from the external operating member to the contact carrier. It will not employ the use of any resilient members or springs in the mechanical actuating path to open the N.C. contacts.

A special case of direct drive design is a switch that complies with IEC 60947-5-1. It is designed so that contact separation will take place even though the contacts may have been welded or “sticking” during fault circuit conditions. A direct drive switch is designed to allow contact separation even if the contacts have been lightly welded during fault circuit conditions. The manufacturer provides the fusing level requirements needed to protect these contacts from welding. The actuator movement and actuator force required affecting contact separation are specified by the switch manufacturer.

This type of switch construction is used to help ensure that contact action takes place when the external operating member is actuated. By avoiding the use of any springs in the actuating path, a solid connection is provided directly from the external mushroom operator to the contacts.

Contact opening should always take place at the same point in the actuating stroke and with the same operating force. By their nature, these types of switches fall into the slow break/slow make category of devices although some special designs have been developed that provide positive opening in snap action devices. With increased awareness of safety concerns and the movement toward designing devices that are used globally, greater emphasis has been placed on the direct drive feature.

Contact Action

Contact action refers to how contacts make and/or break the electrical circuit they intend to control. There are two basic types of contact action: slow make/slow break and snap action.

In slow make/slow break action, the contact carrier and contacts move at the same rate of travel as the actuating mechanism. This action is most often obtained with direct drive switch designs. Since the rate of movement of the contacts is solely dependant on the speed of the external actuator, it can result in slow separation of contacts and create a condition called “teasing”.

In the teasing condition, the air gap created to break the electrical circuit opens so slowly that arcing occurs between the faces of the stationary and moveable contacts. This arcing is detrimental to the contacts because of accelerated contact wear and material transfer and can cause the contacts to weld rather than separate. The arcing can also cause circuit problems by introducing noise.

Snap action design incorporates a resilient member or springs between the actuator and contact carrier. The springs cause the contacts to move independently of the actuating mechanism. The mechanism is designed so that when actuator movement takes place, not only does the contact carrier movement take place, but energy is also built up in the spring system. Prior to the point in the travel of the actuator where contact separation takes place, the contact carrier and spring system are designed to go into an overcenter mode.

At the overcenter point, sufficient energy is available in the spring system allowing the carrier to move independently of any further actuator motion and the contacts snap open. This rapid opening prevents teasing and minimizes contact welding. Some snap action devices also incorporate direct opening action. The direct opening action occurs slightly later in the travel than the normal snapover point if the contacts were slightly welded.

Mechanically Linked Contacts

This construction has also been known as “positively guided contacts”. It combines a N.C. and N.O. contact combination to prevent N.C. and N.O. contacts from closing at the same time. This nomenclature is generally applied to control relays, but is also applicable to push buttons, pressure and temperature switches, and other control circuit devices. It is generally used for checking control circuit functions.

Time Delay

Time delay of a switching device is the interval between the time when the external operator of the switching device is actuated and the time when the contact action actually occurs.

In a switching device where time delay is provided, contact action takes place at a predetermined time interval after physical action has taken place to displace the external operator in a sufficient manner to operate the device. This time delay is fixed in some devices and adjustable in others to meet circuit requirements. Pneumatic timers are commonly used to perform this function.

Stacking

A switching device that has been designed for stacking has provisions for attaching multiple contact elements to the operator.

Stacking provides a means for multiple circuits to be actuated from a single external operator. A switching device with this capability can perform multiple functions or combinations of functions depending on the type of external operator. A selector switch type operator with several positions in combination with multiple contact elements is one example of this type of device.

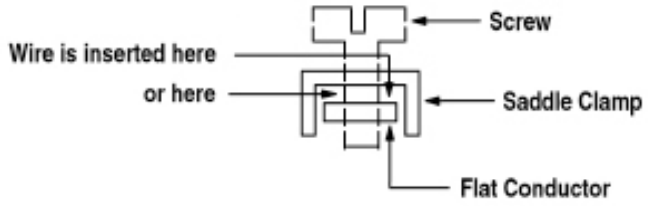
Wiring Termination

The following are examples of some of the more common methods of termination used.

Binding Head Screw
This screw has a larger than normal head. The underside of the screw head has a groove where the wire seats and is secured when the screw is tightened. It is most effective when used with solid wire. A cup washer can be added to accommodate stranded wire, but care must be exercised to ensure that all strands are secured

Saddle Clamp
This is a U-shaped clamp with a screw in the center. The screw threads into a flat conductor on the switching device and the legs of the U slide over the edges of the flat conductor in order to trap the wire.

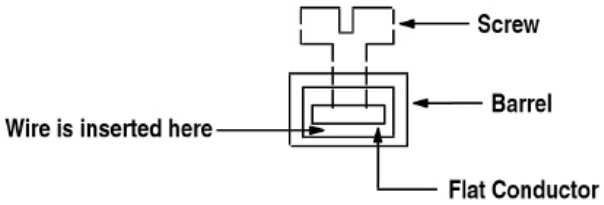
Figure 5.



The saddle clamp should be designed so it tilts to securely clamp a single wire on one side or a different wire size on each side of the clamp.

Barrel Type — This is similar to the saddle clamp design, but instead of a U-shaped clamp, the clamp is rectangular.

Figure 6.



The screw is not threaded into the flat conductor but rather bears against its top surface. This causes the barrel to be drawn upward clamping the wire between the undersurface of the flat conductor and the lower portion of the barrel. A major advantage is the wire is easy to insert into the clamping area.

Pressure Plate
A pressure plate is essentially a flat piece of material with a screw in the center. As with the saddle clamp, the screw threads into the flat conductor on the switching device. Even though the pressure plate is flat, it is designed to force the individual strands of wire to the center of the face plate that comes in contact with the conductor on the switching device where they are restrained. In addition, features are often designed into the body of the switching device that prevent any wire strands from escaping the pressure plate clamping action.

Stab Type
This type of termination is often termed quick-connect, push-on, fast-on, etc. The connection between the switching device and the wire is made with special complementary connection parts. The male part is normally built into the switching device and the female part is mechanically attached to the wire end. Termination is accomplished by mating the connector parts. This method provides a quick way to attach wires to the switching device and it is easy to remove the wires for service.

PC Pin
These are switching devices that can be soldered directly to a printed circuit board or plugged with pin connectors into receptacles mounted on the board.

Lugs and Ferrules
These devices are mechanically secured to the wire end. They make it easier to attach the wire to the switch terminal. They are normally used with stranded wire.

- Lugs provide a flat projection that is usually shaped like a fork or ring. The projection can be inserted under the head of the screw, inserted into saddle clamps, or slipped under pressure plates.
- Ferrules provide a pin type projection well suited for use with saddle clamps, pressure plates, and barrel type terminals.

Solder
Solder can be applied to the end of stranded wire to prevent the individual strands of wire from separating. The end of the wire becomes solid when soldered and can be used with saddle clamps, pressure plates, and barrel type terminals. It should be noted that the solder end will be quite hard and will resist the crushing effect of clamping means. Because of the irregular shape obtained through soldering, only partial contact between the wire and the terminal could result.

Spring-Clamp
This termination style is designed to minimize wiring time. The optimized spring-clamp is designed to reduce stress relaxation while maintaining contact force. An opening force is applied by a lever. The wire is then inserted and the opening force is removed. Upon force removal, the spring-clamp closes on the wire. This design is good for vibration environments.

Because of the large variety of termination options and the importance of establishing and maintaining a reliable connection between the switching device and the circuit, standards have been developed to address this area. The Underwriters Laboratories Pullout and Secureness test is used to insure that termination methods have sufficient strength to retain the wire under conditions of use. This test also determines if the wire strands have been damaged during the wiring process or are susceptible to breakage under conditions of use.

Finger-Safe

A finger-safe device provides a degree of protection from accidental, casual contact of live electrical parts by personnel. Only those components meeting or exceeding the requirements of IEC standard IP2X (listed under IEC 529) can be considered finger-safe.

Those standards describe a model test finger, along with guidelines for the manner in which the test finger is to be manipulated in the vicinity of the wiring terminals to determine if the switching device provides the required degree of protection.

Some switching devices achieve the finger-safe condition by basic device design while others require an external attachment.

The finger-safe feature is becoming more prevalent as safety issues take on added importance. Higher voltage levels pose a greater risk of injury and liability. A concern of finger-safe design is it may provide a false sense of security to personnel who have access to the area where electrical terminations are made.

Every switch serves as just one element in a complete system. Where and how that system operates plays a significant role in which switch will deliver the most cost-effective performance over time. In the section that follows, you'll gain a better understanding of some of the extraordinary issues involved in switch specification.

Environmental Considerations

Careful consideration of the environment to which the switching device is subjected will help ensure proper operation and acceptable service life. Consideration of external environmental conditions of the operators includes temperature and humidity, shock and vibration, and exposure to washdown, cutting fluids, etc., encountered during operation.

In installations where an unfriendly external environment exists, the switching device should be housed in an enclosure designed to isolate it from the environment. Various enclosure ratings have been developed for use in specific environments and these ratings are regulated by industry standards. The external environment of the switching device can have a profound effect on the operation of the device and on its service life.

Conditions generated within enclosures can also have a negative effect on switch operation and life. Condensation, internally generated chemicals, or trapped dirt are some of the more common problems. In addition, since each switching device is made of a variety of materials, each produces its own internal environment. Caution must be taken during the design of the switching device to ensure the materials selected are proper for this kind of device and are compatible with one another.

The following information points out some key internal and external conditions affecting switching devices, as well as their effects.

Temperature
All electrical devices have a maximum operating temperature rating and this rating is generally understood by the user. The maximum storage temperature and the effects of low temperature are not as well-understood.

Exceeding the high temperature limits can cause degradation of materials within the switch. This degradation can weaken switch parts or release gases from plastics and elastomers. A change in physical dimensions may occur, affecting operational travel and force. A very low temperature environment can cause sticking of the actuator and compromise the return action provided by the internal springs within the switching devices. Great care should be taken to exclude freezing liquids from the vicinity of the external operator or the switch may be inoperative under available levels of operating force.

Large fluctuations in temperature can lead to condensation of water or other liquids, and result in the problems relating to humidity, chemicals, and gases listed below (in those cases it is generally helpful to ventilate the enclosure).

Humidity
Moisture can cause the formation of rust and corrosion on metallic parts as well as contribute to electrical problems such as arc tracking.

Chemicals and Gases
This class of contaminants can cause degradation of material used in the product in a

variety of ways. Corrosion of metallic parts and the degradation of physical properties of plastics and elastomers are among the most common effects. The formation of conductive films on the surface of the insulation can cause arc tracking.

Dirt and Debris
Whether originating internally from wear or damage, or externally, this material can cause friction between moving parts, increase wear, and reduce switch life. Dirt on contacts increases resistance and contributes to contact reliability problems.

Shock and Vibration
Consideration must be given to the shock and vibration to which the switching device is subjected. Severe shocks can cause unintended momentary contact operation that could result in circuit malfunction. Long term exposure to vibration can cause premature wear of the switch elements and generation of internal dirt. Even a poorly designed panel door can repeatedly subject a switching device to damaging shock and vibration.

It's also important to handle a switch with care during installation to avoid damaging shock.

Physical Abuse
Improper handling of the switching device during shipping or installation can cause damage to device components that could affect operation.

Environmentally Sealed Devices

An environmentally sealed device isolates the contact area from the environment.

The most common type of construction has the contacts hermetically sealed within a glass envelope. Prior to sealing, the interior of the glass envelope is filled with an inert gas that keeps the environment around the contacts stable. This construction keeps out explosive gases or contaminants that could affect contact reliability. Since the contacts are not accessible for actuation by mechanical means, they are operated by means of magnetic flux.

A special version of the sealed switch known as a logic reed is used in logic circuits. The logic reed is characterized by very short contact bounce, typically less than 0.5 milliseconds.

Contact isolation can also be accomplished by mechanical means such as a flexible diaphragm. These methods do not, however, provide a true hermetic seal, and are more susceptible to wear and degradation.

Standards and Approvals

Standards have been developed by industry groups and governmental units to help ensure that switching devices meet certain requirements with regard to installation criteria, safe operation, load carrying ability, minimum mechanical and electrical life, etc.

Once a particular design has met the requirements of a specific standard, a marking may be affixed to devices constructed according to that design indicating that the standards of that particular agency have been met.

Users need to be aware of which standards pertain to the products used in their locations and which approvals are required. Requirements vary depending on the application and the governmental unit having jurisdiction. Some of the standards that apply to switching devices are listed below:

- UL 508
- NEMA ICS 5 part 1
- IEC 60947-5-1
- CSA 22.2 No. 14

Switch Life

Switch life can be defined in a variety of ways. It can be defined as the time when the switch physically fails and can no longer provide contact action. It can also be defined as the point when the operating characteristics change to such a degree that switch action is no longer reliable or the parameters fall outside those required for that application. Examples of the latter would be an increase in operating force or excessive travel to obtain contact action.

A switching device may wear out due to mechanical considerations. Repeated operations cause physical wear of parts due to friction, shock, and stress, and can lead to eventual component failure. Dirt and debris generated by the moving mechanism can cause binding and can be a source of contact contamination.

The electrical life of a switch is not necessarily related to its mechanical life. The electrical life of a switch is primarily load dependant, because the electrical load is the main source of heating in — and damage to — current carrying components. High current loads can also contribute to arcing at the contacts during contact action. This arcing action results in contact erosion and deformation and can lead to welding of the contacts. As a result, it is good practice to evaluate both mechanical and electrical life ratings before selecting a switching device.

The switch environment can cause corrosion. This may lead to friction, physical failure of components, and dirt or corrosion in the contact areas.

Low level switching and infrequent use may allow buildup of film on contact faces, affecting contact reliability. Logic reed switches or switches with precious metal contacts are ideal in these applications.

Shock and Vibration

Shock and vibration refer to the physical conditions that are present in the environment where the switch operates. These conditions often introduce undesirable motion into the device mechanism.

Sources of shock can be the normal motion of the equipment where the device is mounted or the expected movement of the entire control system. Such motion may be repetitive in nature or may occur only periodically under specific situations such as startup, etc. The user may try to anticipate random, abnormal conditions which could result in a high shock situation. One-time mishandling during shipping and installation can cause damage that will affect operation.

Another source of high shock is the slamming of control panel doors where the switching devices are mounted. In order to minimize the effect of known vibration, the axis of actuation of the switching device should not lie on the same plane as that of the direction of normal equipment vibration.

Contact reliability can be affected by shock and vibration. Continual vibration causes mechanical wear and under load conditions, arcing can lead to welding of contacts. A severe shock can cause unintended, momentary contact operation that could result in circuit malfunction.

The mechanical wear caused by long term exposure to vibration can result in the generation of dirt and debris which affects contact reliability and causes added friction in the sliding portions of the mechanism.

Dielectric Strength

Dielectric strength is a measure of the ability of the insulation used in the switching device to withstand the application of a voltage across its surface or through its mass. This will determine the maximum electrical rating of the device.

Degradation of the dielectric strength of insulation can lead to failure of the device. Unintended electrical continuity may be established between circuit elements and ground. In either case, the result is a failure of the switch to perform its intended function.

The most common type of failure is due to arc tracking across the surface of the insulation. The combination of a particular insulation and environmental conditions such as moisture and/or certain gases in the presence of an electrical arc can result in the buildup of a conducting path.

Contact Block Ratings

The contact block rating of a switching device is the electrical load that the device is capable of switching. This rating is expressed in voltage and current and typically refers to the maximum values that can be switched in a specified number of operations. Although contact blocks are usually rated for maximum conditions, there is a practical low load limit that the contacts will switch in a reliable manner.

Exceeding the high loads can cause burning and pitting of the contacts leading to welding and contributing to arc tracking. If the load to be switched is of a very low energy level, any contaminants or non-conducting films on the contacts may prevent a circuit from being established when the contacts are operated. If loads below 48V DC and 0.1 A, or below 24V AC and 0.4 A, are to be switched, the user must be cautious when selecting the contact materials. If the switching is within a typical Type 4/4X/13 environment, the quadfurcated/pentafurcated blocks should be used for ultimate reliability. If the switching is within Class 1 and 2 Division 2 environment, without a sealing well or a conduit seal off, logic reed, sealed switch, or stackable sealed switch contact blocks should be used. If this type of switch is used at the high end of the rating, then caution should be exercised if these contacts are used for switching low energy loads. The feature built in for establishment of low energy loads may have been burned away during high load switching operations.

Due to the growing popularity of solid-state devices being used in control circuits, the trend in industry is toward lower energy loads.

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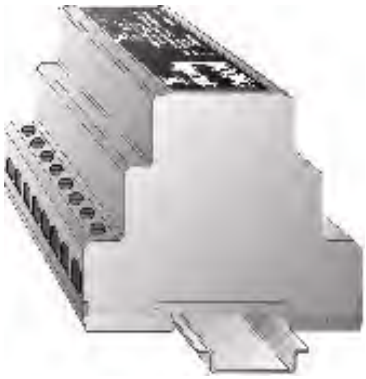
2.3. Critec DSF-6A-275 Surge Protection

INSTALLATION INSTRUCTIONS



MODEL NUMBER
DSF-6A-30V
DSF-6A-75V
DSF-6A-150V
DSF-6A-275V
DSF-10A-150V
DSF-20A-150V
DSF-10A-275V
DSF-20A-275V

1. PREPARATION

DANGER: *Electrical shock or burn hazard. Installation of this DINLINE Surge Filter should only be made by qualified personnel. Failure to lockout electrical power during installation or maintenance can result in fatal electrocution or severe burns. Before making any connections to the electrical panel be sure that power has been removed from all associated wiring, electrical panels, and other electrical equipment.*

CAUTION NOTES:

1. *Check to make sure line voltage does not exceed Surge Filter voltage requirement.*
2. *Prior to installation ensure that the DSF is of the correct voltage, current, and frequency rating for your application.*
3. *The earth terminal must be connected to a low impedance earth (< 10 ohms) for correct operation.*
4. *Do not perform a "Flash Test" or use a Mega-Ohm Meter (Megger) to test circuits that are protected with DSF modules. Damage may occur to the DSF modules.*
5. *Follow all instructions to ensure correct and safe operation.*
6. *Do not attempt to open or tamper with the DSF units in any way as this may compromise performance and will void warranty.*

2. INTRODUCTION

Dinline Surge Filters (DSF) are packaged in "DIN 43 880" profile enclosures for simple installation onto 35mm DIN rails. They can be selected for use on distribution systems with maximum RMS voltages of 30V, 75V, 150V or 275V at frequencies of 50/60Hz. For applications were the voltage regulation on site is poor, refer to the Transient Discriminating Filter (TDF) product range.

3. QUICK INSTALLATION OVERVIEW

Install in the following manner:

1. Ensure that power is removed from the area and the circuits that will be connected.
2. Snap lock the DSF module to the DIN rail.
3. Install the appropriate upstream overcurrent protection (refer to Section 8)
4. Connect wiring to the indicated input and output terminals.
5. Apply power and observe correct operation of the Status Indication LED.

4. PROTECTION CONCEPTS

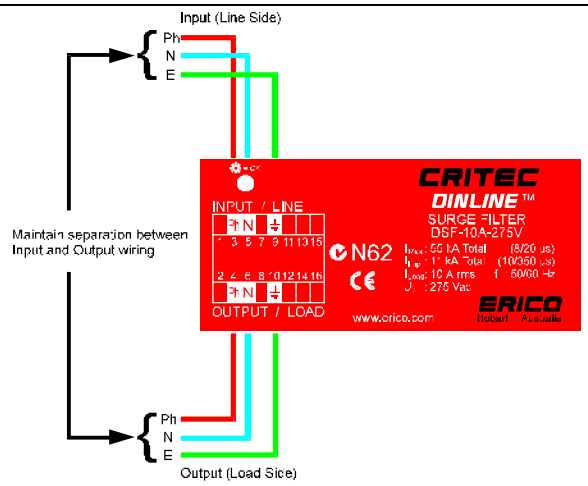
To optimise effectiveness of the DSF protection, the unprotected and protected wiring should be separated. Wiring from the exposed transient source to the DSF should be considered unprotected and kept approximately 300mm from all other wiring wherever possible. Wiring on the equipment side of the DSF should be considered protected.

The separation of protected and unprotected wiring is recommended to minimize the risk that transients conducted on unprotected wiring may cross couple onto protected circuits, and diminish the level of protection available from the DSF module.

The terminals on the DSF module are labeled "INPUT/LINE" (unprotected side) and "OUTPUT/LOAD" (protected side) assuming that the source of the transients is on the input side of the DSF module.

For applications where the transient source is on the load side of the DSF module, the DSF should be reverse connected with the INPUT/LINE terminals connected to the load side, toward the source of the transients.

NOTE: *The terminals on the DSF-6A modules are labeled "L1", "L2" (unprotected side) and "E1", "E2" (protected side). For DC systems the polarity of L1/E1 connections may be either positive or negative with respect to L2/E2. For single phase AC systems with neutral it is recommended to use L1/E1 for the "hot"/phase/line conductors and L2/E2 terminals for the neutral conductors.*



5. MOUNTING

DSF's are designed to clip to 35mm DIN rails (standard EN50022). Unless otherwise mechanically restrained, use horizontal DIN rails with the DSF module spring clips to the bottom and the label text the correct way up.

NOTE: *DSF's must be installed in an enclosure or panel that:*

- *prevents the DSF unit temperature from exceeding 60°C*
- *provides adequate electrical and safety protection*
- *prevents the ingress of moisture and water*
- *allows DSF status indicators to be inspected*

6. RESIDUAL CURRENT DEVICES

Where RCD's/ELCB's protectors are used, it is preferable that the DSF modules be installed prior to these devices (i.e. upstream). If this is not done, nuisance tripping of the RCD's/ELCB's may occur during transient activity.

7. CONDUCTOR TERMINATION

Each DSF terminal is designed to accept wire sizes from 1.5mm² to 6mm² solid or stranded conductor. The wire insulation should be stripped back 8mm before terminating into the tunnel terminal.

NOTE: *Do not use greater than 1Nm of torque when tightening the terminals. Where two wires may need to be terminated into one terminal, the permissible wire size is 4mm² each.*

8. FUSING AND ISOLATION

Overcurrent protection must be installed in the upstream circuit of every DSF to provide protection to the unit itself, the load and the wiring in case of fault situations. The current rating of the breaker or fuse used should be determined according to below. However, the current rating should be less than the rating of the wiring. For example, if a 20A DSF were installed in a circuit with wiring that can carry 16A, then a 16A overcurrent device must be installed upstream to protect both the DSF and wiring from overload.

MAX FUSE SIZES:	*DSF RATING*	*FUSE RATING*
	6A	**6A**
	10A	**10A**
	20A	**20A**

9. STATUS INDICATION

DSF modules have a single Status Indicator LED on the front panel. When power is applied and full surge capacity is available, the Status Indicator will be illuminated. Should power be applied and the indicator fail to illuminate, the DSF should be replaced, as optimum protection is no longer provided.

10. MAINTENANCE & TESTING

Before removing a DSF module from service, ensure that the power has been removed from the module. Replacement of a DSF module should only be undertaken by qualified personnel.

NOTE: *DSF units should be inspected periodically, and also following any periods of lightning or transient voltage activity. Check the Status Indicator and replace the module if it is not illuminated as detailed in Section 9 STATUS INDICATION.*

11. EXTENDED WARRANTY

This product has a limited warranty to be free from defects in materials and workmanship for a period of five (5) years from the date of dispatch from the Manufacturer. The Purchaser acknowledges that lightning is a natural event with statistical variation in behaviour and energy levels which may exceed the product ratings, and 100 % protection is not offered and cannot be provided for. Therefore the Manufacturer's liability is limited to the repair or replacement of the product (at the Manufacturer's sole option) which in its judgement has not been abused, misused, interfered with by any person not authorised by the Manufacturer, or exposed to energy or transient levels exceeding the Manufacturer's specification for the product. The product must be installed and earthed (where applicable) in strict accordance with the Manufacturer's specification and all relevant Electricity and Safety Standards. The Manufacturer and Purchaser mutually acknowledge that the product, by its nature, may be subject to degradation as a consequence of the number and severity of surges and transients that it experiences in normal use, and that this warranty excludes such gradual or sudden degradation. This warranty does not indemnify the Purchaser of the product for consequential claim for the damages or loss of operations or service or profits. Customers should contact their nearest ERICO Lightning Technologies agent to obtain a Product Repair Authorisation Number prior to making any claim under this warranty. This is only a summary of the warranty given by the Manufacturer. The full text of the warranty is set out in the Manufacturer's Conditions of Quotation and Sale. The above limited warranty additional to the rights which arise in respect of the sale of industrial and technical products and services to knowledgeable buyers under the Australian Trade Practices Act 1974 as amended.

2.4. Critec TDS Surge Diverters

ERITECH®

TDS

CRITEC® Transient Discriminating Surge Diverters

ERICO®

Surge Protection And Surge Ratings

The stress, which an SPD will experience under surge conditions, is a function of many complex and interrelated parameters. These include:

- Location of the SPD(s) within the structure – are they located at the main distribution board or within the facility at secondary board, or even in front of the end-user equipment?
- Method of coupling the lightning strike to the facility – for example, is this via a direct strike to the structures LPS, or via induction onto building wiring due to a nearby strike?
- Distribution of lightning currents within the structure – for example, what portion of the lightning current enters the earthing system and what remaining portion seeks a path to remote grounds via the power distribution system and equipotential bonding SPDs?
- Type of power distribution system – the distribution of lightning current on a power distribution system is strongly influenced by the grounding practice for the neutral conductor. For example, in the TN-C system with its multiple earthed neutral, a more direct and lower impedance path to ground is provided for lightning currents than in a TT system.
- Additional conductive services connected to the facility – these will carry a portion of the direct lightning current and therefore reduce the portion which flows through the power distribution system via the lightning equipotential bonding SPD.
- Type of waveshape – it is not possible to simply consider the peak current which the SPD will have to conduct, one also has to consider the waveshape of this surge. It is also not possible to simply equate the areas under the current-time curves (also referred to as the action integral) for SPDs under different waveshapes.

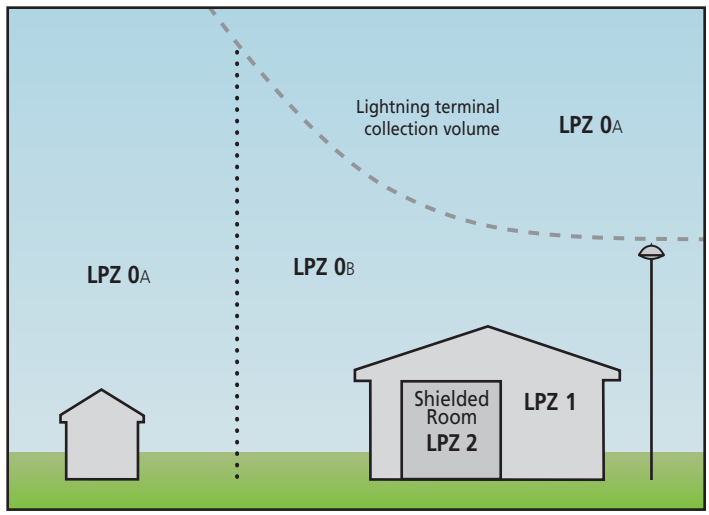
Many attempts have been made to quantify the electrical environment and "threat level" which an SPD will experience at different locations within a facility. The new IEC[SM] standard on lightning protection, IEC 62305-4 "Protection against lightning - Part 4: Electrical and electronic systems within structures" has sought to address this issue by considering the highest surge magnitude which may be presented to an SPD based on the lightning protection level (LPL) being considered. For example, this standard postulates that under a LPL I the magnitude of a direct strike to the structure's LPS may be as high as 200kA 10/350. While this level is possible, its statistical probability of occurrence is approximately 1%. In other words, 99% of discharges will be less than this postulated 200 kA peak current level.

An assumption is made that 50% of this current is conducted via the building's earthing system, and 50% returns via the equipotential bonding SPDs connected to a three wire plus neutral power distribution system. It is also assumed that no additional conductive service exists. This implies that the portion of the initial 200 kA discharge experienced by each SPD is 25 kA.

Simplified assumptions of current dispersion are useful in considering the possible threat level, which the SPD(s) may experience, but it is important to keep in context the assumptions being made. In the example above, a lightning discharge of 200kA has been considered. It follows that the threat level to the equipotential bonding SPDs will be less than 25kA for 99% of the time. In addition, it has been assumed that the waveshape of this current component through the SPD(s) will be of the same waveshape as the initial discharge, namely 10/350, while in reality the waveshape have been altered by the impedance of building wiring, etc.

Many standards have sought to base their considerations on field experience collected overtime. For example, the IEEE® guide to the environment C62.41.1 and the recommended practice C62.41.2 present two scenarios of lightning discharge and different exposure levels under each of these depending on the location where the SPD is installed. In this standard, Scenario II depicts a direct strike to the structure, while Scenario I depicts a nearby strike and the subsequent conducted current into a structure via power and data lines. The highest surge exposure considered feasible to an SPD installed at the service entrance to a facility under Scenario I is 10kA 8/20, while under Scenario II it is considered to be 10kA 10/350 (exposure Level 3).

From the above, it is apparent that the selection of the appropriate surge rating for an SPD depends on many complex and interconnected parameters. When addressing such complexities, one needs to keep in mind that one of the more important parameters in selecting an SPD is its limiting voltage performance during the expected surge event, and not the energy withstand which it can handle.



Protection zones defined by specific product application.

Transient Discriminating Technology

To meet the fundamental requirements of performance, longer service life and greater safety under real world conditions, ERICO has developed Transient Discriminating (TD) Technology.

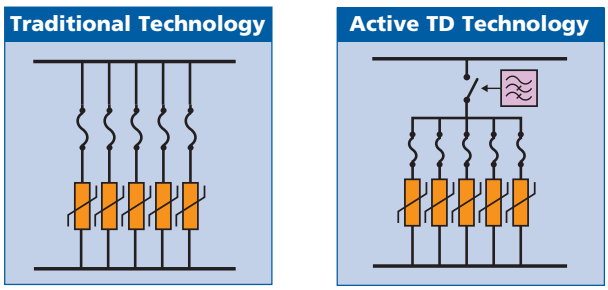
This quantum leap in technology adds a level of "intelligence" to the Surge Protection Device enabling it to discriminate between sustained abnormal over-voltage conditions and true transient or surge events. Not only does this help ensure safe operation under practical application, but it also prolongs the life of the protector since permanent disconnects are not required as a means of achieving internal over-voltage protection.

Traditional Technologies

Conventional SPD technologies utilize metal oxide varistors and/or silicon avalanche diodes to clamp or limit transient events. However, these devices are susceptible to sustained 50/60Hz mains over-voltage conditions which often occur during faults to the utility system. Such occurrences present a significant safety hazard when the suppression device attempts to clamp the peak of each half cycle on the mains over-voltage. This condition can cause the device to rapidly accumulate heat and in turn fail with the possibility of inducing a fire hazard.

The Core of TD Technology

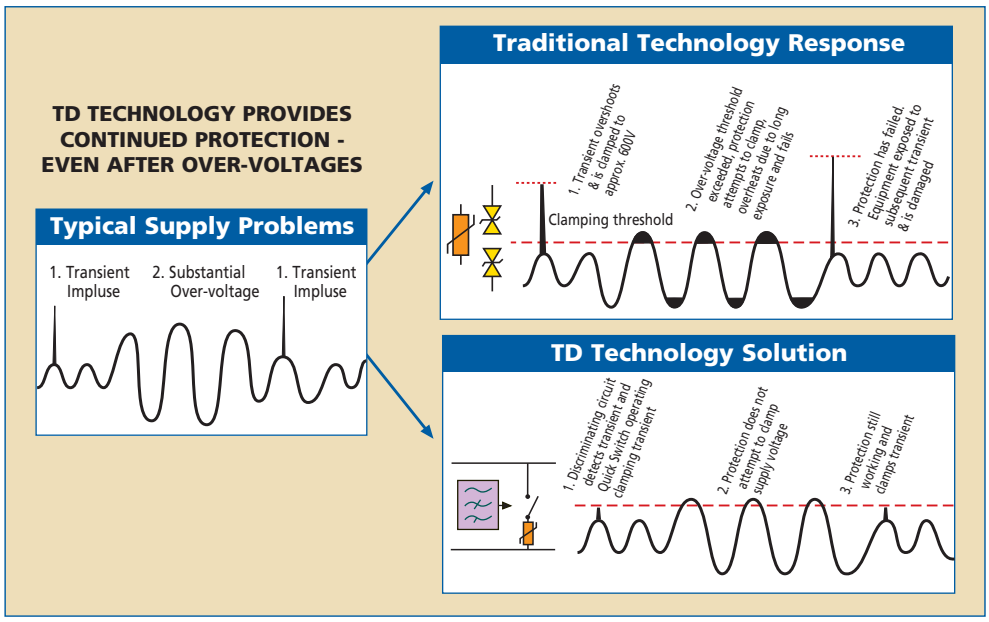
The secret to ERICO's Transient Discriminating Technology is its *active frequency discrimination* circuit. This patented device can discriminate between a temporary over-voltage (TOV) condition and a very fast transient, which is associated with lightning or switching-induced surges. When the transient frequencies are detected, the patented Quick-Switch within TD activates to allow the robust protection to limit the incoming transient. The frequency discriminating circuit that controls the Quick-Switch helps ensure that the SPD device is immune to the effects of a sustained 50 or 60Hz TOV. This allows the device to keep operating, in order to help provide safe and reliable transient protection, even after an abnormal over-voltage condition has occurred.



Meeting & Exceeding UL® Standards

The CRITEC® range of surge protection devices from ERICO® employing TD Technology has been specifically designed to meet and exceed the new safety requirements of UL 1449 Edition 3. To meet the abnormal over-voltage testing of UL 1449 Edition 3, many manufacturers of SPD devices have incorporated fuse or thermal disconnect devices which permanently disconnect all protection from the circuit during an over-voltage event. Transient Discriminating Technology on the other hand will allow the SPD device to experience an abnormal over-voltage up to twice its nominal operating voltage and still remain operational even after this event! This allows the device to help provide safe, reliable and continuous protection to your sensitive electronic equipment. TD Technology is especially recommended for any site where sustained over-voltages are known to occur, and where failure of traditional SPD technologies cannot be tolerated.

The UL 1449 testing standard addresses the safety of an SPD device under temporary and abnormal overvoltage conditions, but does not specifically mandate a design that will give a reliable, long length of service in the real world. Specifically, UL 1449 tests that the SPD remains operational at 10% above nominal supply voltage, allowing SPD manufacturers to design products that permanently disconnect just above that. Most reputable manufacturer's designs allow for up to a 25% overvoltage, while ERICO's TD Technology gives even greater overhead.



TDS130

CRITEC® TDS Surge Diverter - TDS130 Series

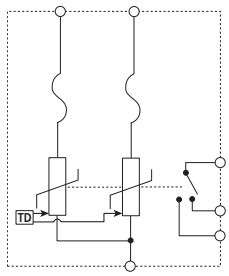
Features

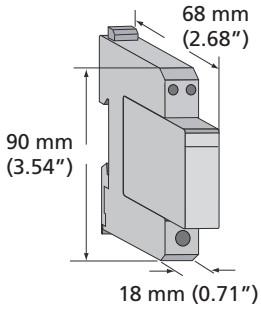
- CRITEC TD Technology with thermal disconnect protection
- Compact package, modular DIN rail mounting for limited space requirements
- Three modes of protection: L-N, L-PE & N-PE
- Indication flags and voltage-free contacts provide remote status monitoring
- Separate plug and base design facilitates replacement of a failed surge module
- 15kA 8/20µs surge rating per mode
- CE, UL® 1449 Edition 3 Listed

Surges and voltage transients are a major cause of expensive electronic equipment failure and business disruption. Damage may result in the loss of capital outlays, such as computers and communications equipment, as well as consequential loss of revenue and profits due to unscheduled system down-time.

The TDS130 series of surge suppressors provide economical and reliable protection from voltage transients on power distribution systems. The TDS130 is specifically designed for the protection of single phase power supplies within instrumentation and control applications. They are conveniently packaged for easy installation on 35 mm DIN rail within control panels.

CRITEC® TD technology helps ensure reliable and continued operation during sustained and abnormal over-voltage events. Internal thermal disconnect devices help ensure safe behavior at end-of life. A visual indicator flag provides user-feedback in the event of such operation. The TDS130 provides a set of optional voltage-free contacts for remote signaling that maintenance is required.





The convenient plug-in module and separate base design facilitates replacement of a failed surge module without needing to undo installation wiring.

Model	TDS1301TR150	TDS1301TR240
Item Number for Europe	702421	702422
Nominal Voltage, U_n	120-150 VAC	220-240 VAC
Max Cont. Operating Voltage, U_c	170VAC	275VAC
Stand-off Voltage	230VAC	440VAC
Frequency	0-100Hz	
Nominal Discharge Current, I_n	8kA 8/20µs per mode	
Max Discharge Current, I_{max}	15kA 8/20µs L-N 15kA 8/20µs L-PE	
Protection Modes	L-G, L-N, N-G	
Technology	TD Technology with thermal disconnect	
Short Circuit Current Rating, I_{sc}	200kAIC	
Back-up Overcurrent Protection	63AgL, if supply > 63A	
Voltage Protection Level, U_p	500V @ 3kA (L+N-G) 800V @ 3kA (L-N)	800V @ 3kA (L+N-G) 1500V @ 3kA (L-N)
Status	N/O, N/C Change-over contact, 250V~/0.5A, max 1.5 mm² (#14AWG) terminals Mechanical flag / remote contacts (R model only)	
Module Width	1 M	
Dimensions H x D x W: mm (in)	90 x 68 x 18 (3.54 x 2.68 x 0.71)	
Weight: kg (lbs)	0.12 (0.26)	
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA-1)	
Connection	1 mm² to 6 mm² (#18AWG to #10AWG) Line and Neutral Terminals ≤25 mm² (#4AWG) stranded ≤35 mm² (#2AWG) solid PE Terminal	
Mounting	35 mm top hat DIN rail	
Temperature	-40°C to 80°C (-40°F to 176°F)	
Humidity	0% to 90%	
Approvals	CE, IEC® 61643-1, UL® 1449 Ed 3 Recognized Component Type 2	
Surge Rated to Meet	ANSI®/IEEE® C62.41.2 Cat A, Cat B IEC 61643-1 Class II UL® 1449 Ed3 In 3kA mode	
Replacement Module	TDS130M150	TDS130M240
Replacement Module (Europe)	702432	702424

TDS150

CRITEC® TDS Surge Diverter - TDS150 Series

Features

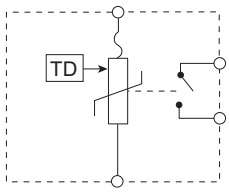
- CRITEC® TD Technology with thermal disconnect protection
- Compact design fits into DIN distribution panel boards and motor control centers
- 35 mm DIN rail mount – DIN 43 880 profile matches common circuit breakers
- Indication flags and voltage-free contacts provide remote status monitoring
- Separate plug and base design facilitates replacement of a failed surge module
- 50kA 8/20µs maximum surge rating provides protection suitable for sub-distribution panels and a long operational life
- Available in various operating voltages to suit most common power distribution systems
- CE, UL® 1449 Edition 3 Listed

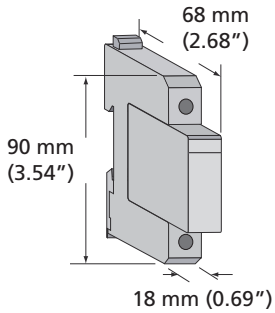
Surges and voltage transients are a major cause of expensive electronic equipment failure and business disruption. Damage may result in the loss of capital outlays, such as computers and communications equipment, as well as consequential loss of revenue and profits due to unscheduled system down-time.

The TDS150 series of surge suppressors provide economical and reliable protection from voltage transients on power distribution systems. They are conveniently packaged for easy installation on 35 mm DIN rail within main distribution panelboards.

CRITEC® TD technology helps ensure reliable and continued operation during sustained and abnormal over-voltage events. Internal thermal disconnect devices help ensure safe behavior at end-of-life. A visual indicator flag provides user-feedback in the event of such operation. As standard, the TDS150 provides a set of voltage-free contacts for remote signaling that maintenance is required.

The convenient plug-in module and separate base design facilitates replacement of a failed surge module without needing to undo installation wiring.





Model	TDS1501SR150	TDS1501SR240	TDS1501SR277	TDS1501SR560
Item Number for Europe	702404	702406	702407	702408
Nominal Voltage, U_n	120-150 VAC	220-240 VAC	240-277 VAC	480-560 VAC
Max Cont. Operating Voltage, U_c	170VAC	275VAC	320VAC	610VAC
Stand-off Voltage	240VAC	440VAC	480VAC	700VAC
Frequency	0-100Hz			
Short Circuit Current Rating, I_{sc}	200kAIC			
Back-up Overcurrent Protection	125AgL, if supply > 100A			
Technology	TD with thermal disconnect			
Max Discharge Current, I_{max}	50kA 8/20µs			
Nominal Discharge Current, I_n	25kA 8/20µs	20kA 8/20		
Protection Modes	Single mode (L-G, L-N or N-G)			
Voltage Protection Level U_p	400V @ 3kA 1.0kV @ In	700V @ 3kA 1.2kV @ In	800V @ 3kA 1.6kV @ In	1.8kV @ 3kA 2.4kV @ In
Status	N/O, N/C Change-over contact, 250V~/0.5A, max 1.5 mm² (#14AWG) terminals Mechanical flag / remote contacts (R model only)			
Dimensions H x D x W: mm (in)	90 x 68 x 18 (3.54 x 2.68 x 0.69)			
Module Width	1 M			
Weight: kg (lbs)	0.12 (0.26)			
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA-1)			
Connection	≤25 mm² (#4AWG) stranded ≤35 mm² (#2AWG) solid			
Mounting	35 mm top hat DIN rail			
Temperature	-40°C to 80°C (-40°F to 176°F)			
Humidity	0% to 90%			
Approvals	CE, IEC® 61643-1, UL® 1449 Ed 3 Recognized Component Type 2			
Surge Rated to Meet	ANSI®/IEEE® C62.41.2 Cat A, Cat B, Cat C ANSI®/IEEE® C62.41.2 Scenario II, Exposure 2, 50kA 8/20µs IEC 61643-1 Class II UL® 1449 Ed3 In 20kA mode			
Replacement Module	TDS150M150	TDS150M240	TDS150M277	TDS150M560

TDS1100

CRITEC® TDS Surge Diverter - TDS1100 Series

Features

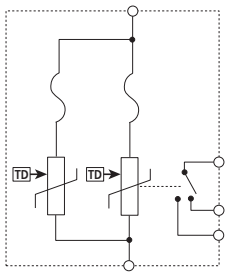
- CRITEC® TD Technology with thermal disconnect protection
- Compact design fits into DIN distribution panel boards and motor control centers
- 35 mm DIN rail mount – DIN 43 880 profile matches common circuit breakers
- Indication flags and voltage-free contacts provide remote status monitoring
- Separate plug and base design facilitates replacement of a failed surge module
- 100kA 8/20µs maximum surge rating provides protection suitable for sub-distribution panels and a long operational life
- Available in various operating voltages to suit most common power distribution systems
- CE, UL® 1449 Edition 3 Listed

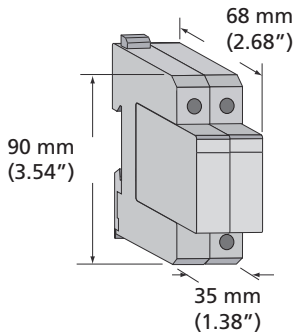
Surges and voltage transients are a major cause of expensive electronic equipment failure and business disruption. Damage may result in the loss of capital outlays, such as computers and communications equipment, as well as consequential loss of revenue and profits due to unscheduled system down-time.

The TDS1100 series of surge suppressors provide economical and reliable protection from voltage transients on power distribution systems. They are conveniently packaged for easy installation on 35 mm DIN rail within main distribution panelboards.

CRITEC® TD technology helps ensure reliable and continued operation during sustained and abnormal over-voltage events. Internal thermal disconnect devices help ensure safe behavior at end-of-life. A visual indicator flag provides user-feedback in the event of such operation. As standard, the TDS1100 provides a set of voltage-free contacts for remote signaling that maintenance is due.

The convenient plug-in module and separate base design facilitates replacement of a failed surge module without needing to undo installation wiring.





Model	TDS11002SR150	TDS11002SR240	TDS11002SR277	TDS11002SR560
Item Number for Europe	702409	702411	702412	702413
Nominal Voltage, U_n	120-150 VAC	220-240 VAC	240-277 VAC	480-560 VAC
Max Cont. Operating Voltage, U_c	170VAC	275VAC	320VAC	610VAC
Stand-off Voltage	240VAC	440VAC	480VAC	700VAC
Frequency	0-100Hz			
Short Circuit Current Rating, I_{sc}	200kAIC			
Back-up Overcurrent Protection	125AgL, if supply > 100A			
Technology	TD with thermal disconnect			
Max Discharge Current, I_{max}	100kA 8/20µs			
Impulse Current, I_{imp}	12.5kA 10/350µs			
Nominal Discharge Current, I_n	50kA 8/20µs	40kA 8/20µs		
Protection Modes	Single mode (L-G, L-N or N-G)			
Voltage Protection Level, U_p	400V @ 3kA 1.0kV @ 20kA	700V @ 3kA 1.2kV @ 20kA	800V @ 3kA 1.6kV @ 20kA	1.8kV @ 3kA 2.4kV @ 20kA
Status	N/O, N/C Change-over contact, 250V~/0.5A, max 1.5 mm² (#14AWG) terminals Mechanical flag / remote contacts (R model only)			
Dimensions H x D x W: mm (in)	90 x 68 x 35 (3.54 x 2.68 x 1.38)			
Module Width	2 M			
Weight: kg (lbs)	0.24 (0.53)			
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA-1)			
Connection	≤25 mm² (#4AWG) stranded ≤35 mm² (#2AWG) solid			
Mounting	35 mm top hat DIN rail			
Temperature	-40°C to 80°C (-40°F to 176°F)			
Humidity	0% to 90%			
Approvals	CE, IEC® 61643-1, UL® 1449 Ed 3 Recognized Component Type 2			
Surge Rated to Meet	ANSI®/IEEE® C62.41.2 Cat A, Cat B, Cat C ANSI®/IEEE® C62.41.2 Scenario II, Exposure 3, 100kA 8/20µs, 10kA 10/350µs IEC 61643-1 Class I and Class II UL® 1449 Ed3 In 20kA mode			
Replacement MOV Module	TDS150M150	TDS150M240	TDS150M277	TDS150M560

TDS350

CRITEC® TDS Surge Diverter - TDS350 Series

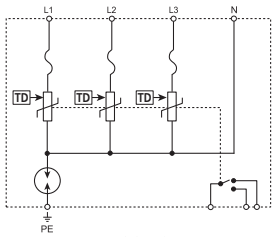
Features

- CRITEC® TD Technology with thermal disconnect protection
- Compact design fits into DIN distribution panel boards and motor control centers
- 35 mm DIN rail mount – DIN 43 880 profile matches common circuit breakers
- Indication flags and voltage-free contacts provide remote status monitoring
- Separate plug and base design facilitates replacement of a failed surge module
- 50kA 8/20µs maximum surge rating provides protection suitable for sub-distribution panels and a long operational life
- Available in various operating voltages to suit most common power distribution systems
- CE, UL® 1449 Edition 3 Listed

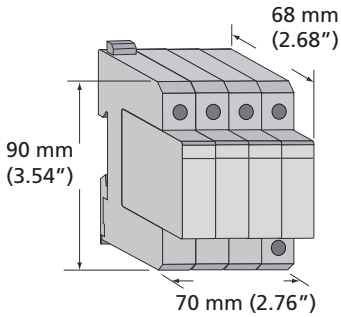
Surges and voltage transients are a major cause of expensive electronic equipment failure and business disruption. Damage may result in the loss of capital outlays, such as computers and communications equipment, as well as consequential loss of revenue and profits due to unscheduled system down-time.

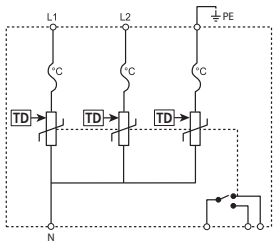
CRITEC® TD technology helps ensure reliable and continued operation during sustained and abnormal over-voltage events. Internal thermal disconnect devices help ensure safe behavior at end-of-life. A visual indicator flag provides user-feedback in the event of such operation. As standard, the TDS provides a set of voltage-free contacts for remote signaling that maintenance is due.

The convenient plug-in module and separate base design facilitates replacement of a failed surge module without needing to undo installation wiring.

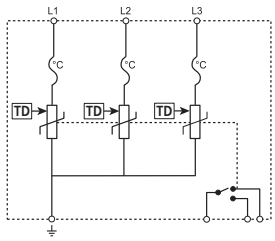


TDS350TT

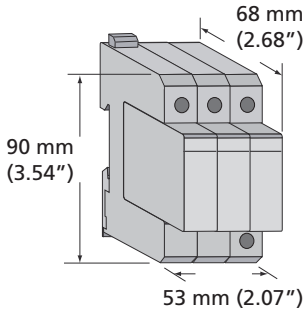




TDS50120/240



TDS350TNC



Model	TDS350TNC150	TDS50120240	TDS350TNC277	TDS350TT150	TDS350TT277
Item Number for Europe	702414	702419	702417	702416	702418
Nominal Voltage, U_n	120-150 VAC		240-277 VAC	120-150 VAC	240-277 VAC
Max Cont. Operating Voltage, U_c	170/295VAC	240/480VAC	320/536VAC	170/295VAC	320/536VAC
Stand-off Voltage	240/415VAC	240/480VAC	480/813VAC	240/415VAC	480/813VAC
Frequency	0-100Hz				
Short Circuit Current Rating, I_{sc}	200kAIC				
Back-up Overcurrent Protection	125AgL, if supply > 100A				
Technology	TD with thermal disconnect				
Max Discharge Current, I_{max}	50kA 8/20µs			12.5kA 10/350µs N-PE 50kA 8/20µs	
Nominal Discharge Current, I_n	25kA 8/20µs		20kA 8/20	25kA 8/20µs	20kA 8/20
Protection Modes	L-N	L-N, N-PE	L-N	L-N, N-PE	
Voltage Protection Level, U_p	400V @ 3kA 1.0kV @ In		800V @ 3kA 1.6kV @ In	400V @ 3kA 1.0kV @ In	800V @ 3kA 1.6kV @ In
Status	N/O, N/C Change-over contact, 250V~/0.5A, max 1.5 mm² (#14AWG) terminals Mechanical flag / remote contacts				
Dimensions H x D x W: mm (in)	90 x 68 x 53 (3.54 x 2.68 x 2.07)			90 x 68 x 70 (3.54 x 2.68 x 2.76)	
Module Width	3 M			4 M	
Weight: kg (lbs)	0.36 (0.79)			0.5 (1.10)	
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA-1)				
Connection	≤25 mm² (#4AWG) stranded ≤35 mm² (#2AWG) solid				
Mounting	35 mm top hat DIN rail				
Temperature	-40°C to 80°C (-40°F to 176°F)				
Humidity	0% to 90%				
Approvals	CE, IEC® 61643-1, UL® 1449 Ed 3 Recognized Component Type 2				
Surge Rated to Meet	ANSI®/IEEE® C62.41.2 Cat A, Cat B, Cat C ANSI®/IEEE® C62.41.2 Scenario II, Exposure 2, 50kA 8/20µs IEC 61643-1 Class II UL® 1449 Ed3 In 20kA mode				
Replacement MOV Module	TDS150M150		TDS150M277	TDS150M150	TDS150M277
Replacement GDT Module	-			SGD112M	
Replacement GDT Module (Europe)	-			702403	

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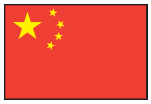

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Fax +1-440-248-0723

2.5. Critec DAR-275V Alarm Relay

INSTALLATION INSTRUCTIONS

MODEL NUMBER
DAR 275V

1. PREPARATION

DANGER: *Electrical shock or burn hazard. Installation of this device should only be made by qualified personnel. Failure to lockout electrical power during installation or maintenance can result in fatal electrocution or severe burns. Before making any connections be sure that power has been removed from all associated wiring, electrical panels, and other electrical equipment.*

CAUTION NOTES:

1. *The installation of this device should follow all applicable electrical codes, such as the National Electrical Code.*
2. *Check to make sure line voltage does not exceed DAR275V voltage ratings.*
3. *Follow all instructions to ensure correct and safe operation.*
4. *Do not attempt to open or tamper with the DAR in any way as this may compromise performance and will void warranty. No user serviceable parts are contained.*

2. INTRODUCTION

Selected DSD, TDS & TDF DINLINE Surge Protection Devices include status monitoring circuits which provide visual status display of device capacity. They may also provide a low voltage opto-coupler alarm output circuit that can be connect to the DAR to provide potential free (Form C) change-over contacts. The DAR alarm contacts may be used to provide output to external alarm systems or remote monitoring circuits.

One DAR can be used per DSD/TDS/TDF opto-coupler alarm or up to 16 DSD opto-coupler alarms can be connected in series to the one DAR to provide a common output. It is recommended that the DAR be powered from the same power circuit that feeds the device(s) being monitored, however the DAR can be powered from other circuits. This allows for example, one DAR unit to be connected to separate SPDs that are protecting a three phase circuit.

Note. Depending upon the usage of the DAR output contacts, failure of power to the DAR may be interpreted as a failure of one or more of the SPDs being monitored. Visual inspection of the DAR and SPDs status displays would determine this.

3. MOUNTING

The DAR is designed to clip to 35mm (top hat) DIN rails (standard EN50022). Unless otherwise mechanically restrained, use horizontal DIN rails with the DAR module spring clips to the bottom and the label text the correct way up.

NOTE: The DAR must be installed in an enclosure or panel that:

- *prevents the DAR temperature from exceeding 131°F (55°C)*
- *provides adequate electrical and safety protection*
- *prevents the ingress of moisture and water*
- *allows DAR status indicators to be inspected*

4. ELECTRICAL CONNECTION

The interconnecting wiring should:

- be of size #10 to #14 AWG (2.5mm² to 6mm²) solid or stranded conductor.
- The wire insulation should be stripped back 5/16" (8mm).
- NOTE: Do not use greater than 9inlbs (1Nm) of torque when tightening the terminals.

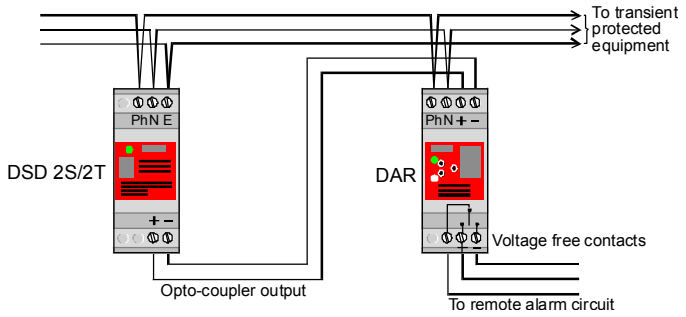
CONNECTION TO TELECOMMUNICATIONS NETWORKS

The DAR is approved for use in Australia where the alarm contacts may be connected to private lines or building cabling associated with the telecommunications network. NO direct connection to the public switched network should be made.

INSTALLATION INSTRUCTIONS

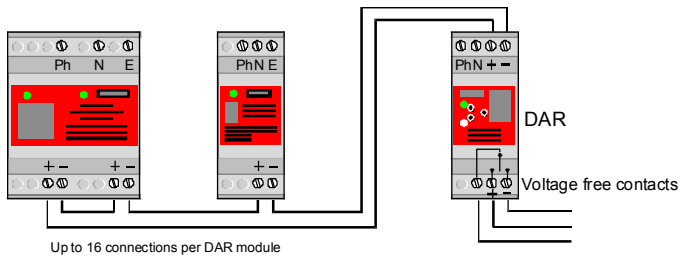
5. INTERCONNECTION

When connecting the DAR to a single opto-coupler output the + terminal of the SPD should connect to the + terminal on the DAR. The – terminal should connect to the -- terminal.



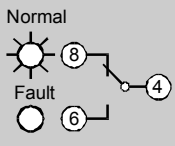
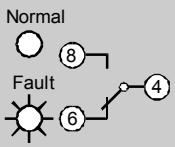
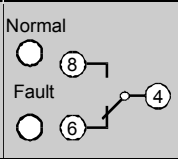
+/- terminal connections are polarity sensitive. Do not reverse.

When connecting the DAR to multiple opto-couplers the opto-couplers should be connected in series with + terminal of one connected to the – terminal of the next. The DAR + terminal should connect to + SPD terminal at one end of the series connection and the – DAR terminal connect to the – SPD terminal at the other end of the series connection.



+/- terminal connections are polarity sensitive. Do not reverse.

5. STATUS INDICATION

	✓	!	✗
STATUS	Protection Operational	Protection Alarm	Fault Mode
DISPLAY			
EXPLANATION	Normal operation Normal (green) indicator ON Red indicator OFF Relay is energised Power is supplied	DSD in alarm mode or power to DSD has been removed Normal (green) indicator OFF Red indicator ON Relay is de-energised Power is supplied	Power to DAR removed Protection status unknown Normal (green) indicator OFF Red indicator OFF Relay is de-energised Power is OFF

6. FUSING AND ISOLATION

Overcurrent protection must be installed in the upstream circuit of the power supply to the DAR to provide protection to the unit itself and the wiring in case of fault conditions.

The fuse rating should be based on the wiring size used to connect to the DAR Ph & N terminals. Australian regulations AS3000-1991, Table B2 specifies the following upstream protection for single phase circuits, unenclosed in air.

Cable Size	HRC Fuse or	CB Rewirable Fuse
1.5mm^2	16A	12A
2.5mm^2	20A	16A
4mm^2	25A	20A
6mm^2	32A	25A

Where overcurrent protection of the appropriate rating or smaller is already fitted in the upstream circuit, overcurrent protection at the DAR will not be required

6. MAINTENANCE & TESTING

Before removing a DAR unit from service, ensure that the power has been removed. Maintenance, testing and replacement should only be undertaken by qualified personnel.

Testing of a DAR unit which is connected to a fully functional DSD unit can be accomplished by removing power to the DSD only. The DAR Status indication and output contacts should alter from the Normal to Fault condition.

Testing of the DAR unit alone may be accomplished by disconnecting the + / -connections to the unit. When power is applied the DAR “Fault” Status Indicator should be illuminated. By connecting the + / - terminals together, the “Normal” Status Indicator should be illuminated. The output contacts should alter to the appropriate state.

7. USE OF OTHER INTERFACES

Only DAR units are recommended for the interfacing of equipment to the DSD, TDS & TDF opto-coupler alarm output circuit(s). The direct connection of other equipment to these opto-coupler alarm outputs may not provide sufficient isolation or exceed the opto-coupler specifications. This may damage the SPD and/or the connected equipment. Warranty may be voided under such circumstances.

NOTE: *In connecting to the SPD opto-coupler alarm output(s), do not reverse the +/- connections as damage may occur.*

2.6. Carlo Gavazzi Monitoring Relays

Monitoring Relays
True RMS 3-Phase, 3-Phase+N, Multi-function
Types DPB01, PPB01


DPB01


PPB01

- **TRMS 3-phase over and under voltage, phase sequence and phase loss monitoring relays**
- **Detect when all 3 phases are present and have the correct phase sequence (except for N versions)**
- **Available versions (W4) supplied between phase and neutral**
- **Detect if all the 3-phase-phase or phase-neutral voltages are within the set limits**
- **Upper and lower limits separately adjustable**
- **Measure on own power supply**
- **Selection of measuring range by DIP-switches**
- **Adjustable voltage on relative scale**
- **Adjustable delay function (0.1 to 30 s)**
- **Output: 8 A SPDT relay N.E.**
- **For mounting on DIN-rail in accordance with DIN/EN 50 022 (DPB01) or plug-in module (PPB01)**
- **22.5 mm Euronorm housing (DPB01) or 36 mm plug-in module (PPB01)**
- **LED indication for relay, alarm and power supply ON**

Product Description

3-phase or 3-phase+neutral line voltage monitoring relay for phase sequence, phase loss, over and under voltage (separately adjustable set points) with built-in time delay function.
Supply ranges from 208 to 480 VAC covered by two multivoltage relays.

Ordering Key

DPB 01 C M23

Housing
Function
Type
Item number
Output
Power supply

Type Selection

Mounting	Phase sequence detection	Output	Supply: 208 to 240 VAC	Supply: 380 to 415 VAC	Supply: 380 to 480 VAC
DIN-rail	yes	SPDT	**DPB 01 C M23**	**DPB 01 C M48 W4**	**DPB 01 C M48**
Plug-in	yes	SPDT	**PPB 01 C M23**	**PPB 01 C M48 W4**	
Plug-in	yes	SPDT		**PPB 01 C M48**	
DIN-rail	no	SPDT	**DPB 01 C M23 N**	**DPB 01 C M48 N W4**	**DPB 01 C M48 N**
Plug-in	no	SPDT	**PPB 01 C M23 N**	**PPB 01 C M48 N W4**	
Plug-in	no	SPDT		**PPB 01 C M48 N**	

Input Specifications

Input
L1, L2, L3, N — DPB01: Terminals L1, L2, L3, N; PPB01: Terminals 5, 6, 7, 11; Measure on own supply

Note: Connect the neutral only if it is intrinsically at the star centre

Measuring ranges
208 to 240 VAC — 177 to 275 V_{L-L} AC; M23 versions
380 to 415 VAC — 323 to 475 V_{L-L} AC; PPB01CM48; PPB01CM48N; D/P PB01CM48W4; D/P PB01CM48NW4
380 to 480 VAC — 323 to 550 V_{L-L} AC; DPB01CM48; DPB01CM48N

Ranges
Upper level — +2 to +22% of the nominal voltage
Lower level — -22 to -2% of the nominal voltage

Note: The input voltage must not exceed the maximum rated voltage or drop below the minumum rated voltage reported above.

Hysteresis
Set points from 2 to 5% — 1%
Set points from 5 to 22% — 2%

Output Specifications

Output		SPDT relay
Rated insulation voltage		250 VAC
Contact ratings ($AgSnO_2$)		µ
Resistive loads	AC 1	8 A @ 250 VAC
	DC 12	5 A @ 24 VDC
Small inductive loads	AC 15	2.5 A @ 250 VAC
	DC 13	2.5 A @ 24 VDC
Mechanical life		≥ 30 x 10^6 operations
Electrical life		≥ 10^5 operations (at 8 A, 250 V, cos φ = 1)
Operating frequency		≤ 7200 operations/h
Dielectric strength		
Dielectric voltage		2 kVAC (rms)
Rated impulse withstand volt.		4 kV (1.2/50 µs)

Supply Specifications

Power supply	Overvoltage cat. III (IEC 60664, IEC 60038)
Rated operational voltage through terminals:	
L1, L2, L3, N (DPB01)	
5, 6, 7, 11 (PPB01)	
D/P PB01CM23, D/P PB01CM23N	208 to 240 V_{L-L} AC ±15% 45 to 65 Hz
D/P PB01CM48W4, D/P PB01CM48NW4, PPB01CM48, PPB01CM48N	380 to 415 V_{L-L} AC ±15% (220 to 240 V_{L-N} AC ±15%) 45 to 65 Hz
DPB01CM48, DPB01CM48N	380 to 480 V_{L-L} AC ±15% (220 to 277 V_{L-N} AC ±15%) 45 to 65 Hz
Rated operational power	
DPB01CM23x, PPB01CM23x	13 VA @ 230 ΔVAC, 50 Hz
DPB01CM48x, PPB01CM48x	13 VA @ 400 ΔVAC, 50 Hz Supplied by L1 and L2
DPB01CM48xW4	
DPB01CM48xW4	13 VA @ 400 ΔVAC, 50 Hz Supplied by L1 and N

General Specifications

Power ON delay		1 s ± 0.5 s or 6 s ± 0.5 s
Reaction time		
Incorrect phase sequence or total phase loss		< 200 ms
Voltage level		(input signal variation from -20% to +20% or from +20% to -20% of set value)
Alarm ON delay		< 200 ms (delay < 0.1 s)
Alarm OFF delay		< 200 ms (delay < 0.1 s)
Accuracy		(15 min warm-up time)
Temperature drift		± 1000 ppm/°C
Delay ON alarm		± 10% on set value ± 50 ms
Repeatability		± 0.5% on full-scale
Indication for		
Power supply ON		LED, green
Alarm ON		LED, red (flashing 2 Hz during delay time)
Output relay ON		LED, yellow
Environment		
Degree of protection		IP 20
Pollution degree		3 (DPB01), 2 (PPB01)
Operating temperature		
@ Max. voltage, 50 Hz		-20 to 60°C, R.H. < 95%
@ Max. voltage, 60 Hz		-20 to 50°C, R.H. < 95%
Storage temperature		-30 to 80°C, R.H. < 95%
Housing		
Dimensions	DPB01	22.5 x 80 x 99.5 mm
	PPB01	36 x 80 x 94 mm
Weight		Approx. 120 g
Screw terminals		
Tightening torque		Max. 0.5 Nm according to IEC 60947
Approvals		UL, CSA (except for W4 versions)
CE Marking		Yes
EMC		Electromagnetic Compatibility
Immunity		According to EN 61000-6-2
Emissions		According to EN 61000-6-3

Mode of Operation

Connected to the 3 phases (and neutral) DPB01 and PPB01 operate when all 3 phases are present at the same time, the phase sequence is correct (not N versions) and the phase-phase (or phase-neutral) voltage levels are within set limits.

If one or more phase-phase or phase-neutral voltages exceeds the upper set level or drops below the lower set level, the red LED starts flashing 2 Hz and the output relay releases after the set time period. In any case if phase-neutral measurement is selected both phase-phase and phase-neutral voltages are monitored. If the phase sequence is wrong or one phase is lost, the output relay releases immediately.
Only 200 ms delay occurs. The failure is indicated by the red LED flashing 5 Hz during the alarm condition.

Example 1
(mains network monitoring)

The relay monitors over and under voltage, phase loss and correct phase sequence.
In case of N versions, the relay monitors over and under voltage.

Example 2
(load monitoring)

The relay releases in case of interruption of one or more phases, when one or more voltages drop below the lower set level or exceed the upper set level.

Function/Range/Level and Time Delay Setting

Adjust the input range setting the DIP switches 3 and 4 as shown below.

Select the desired function setting the DIP switches 1 and 2 as shown below.

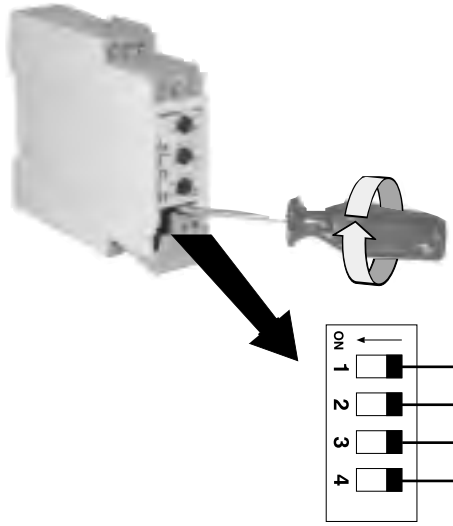
To access the DIP swiches open the grey plastic cover as shown below

Selection of level and time delay:

Upper knob:
Setting of lower level on relative scale.

Centre knob:
Setting of upper level on relative scale.

Lower knob:
Setting of delay on alarm time on absolute scale (0.1 to 30 s).



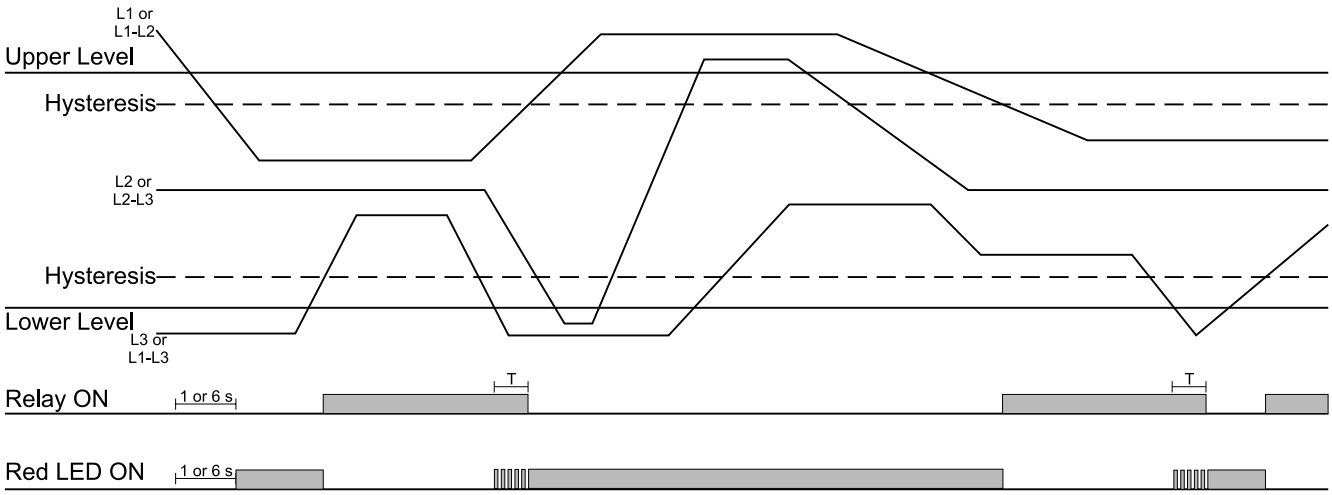
Power ON delay
ON: 6 s ± 0.5 s
OFF: 1 s ± 0.5 s

Monitored voltage
ON: Phase-Neutral
OFF: Phase-Phase

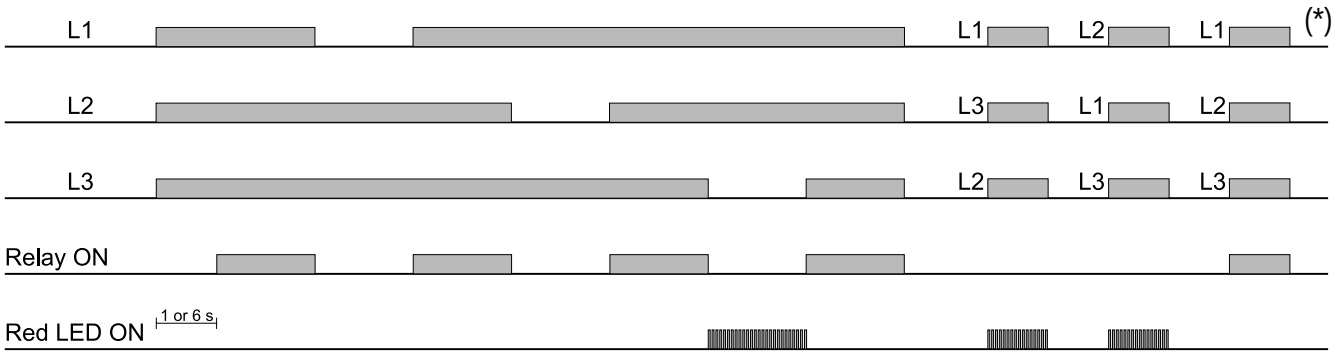
Measuring range

SW3	ON	ON	OFF	OFF
SW4	ON	OFF	ON	OFF
M23 Ph-Ph Voltage	208 VAC	220 VAC	230 VAC	240 VAC
M48 Ph-Ph Voltage	380 VAC	400 VAC	415 VAC	480 VAC DPB01CM48, DPB01CM48N only
M48 Ph-N Voltage	220 VAC	230 VAC	240 VAC	277 VAC DPB01CM48, DPB01CM48N only

Operation Diagrams



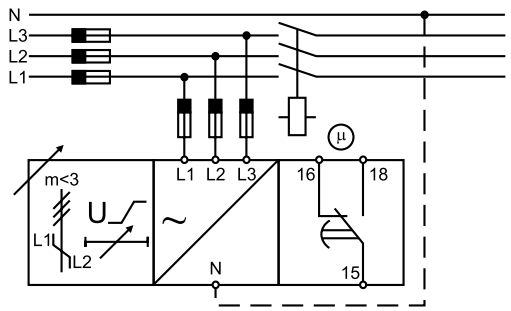
Operation Diagrams (cont.)



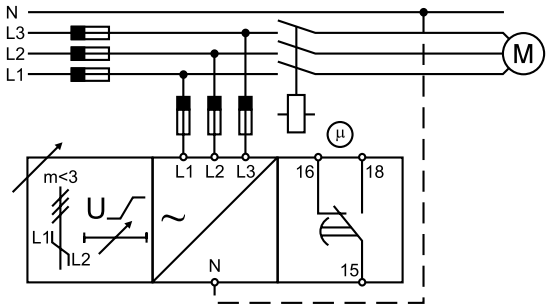
(*) N versions don't detect incorrect phase sequence.

Wiring Diagrams

Example 1

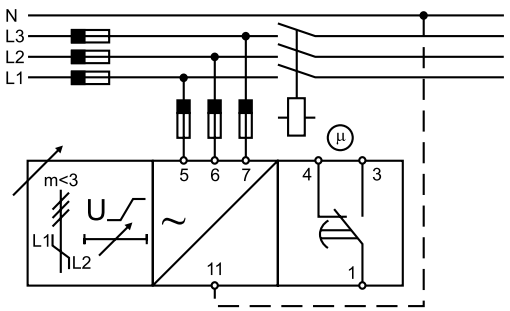


Example 2

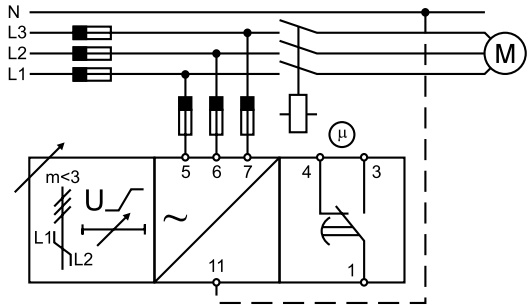


DPB01

Example 1



Example 2



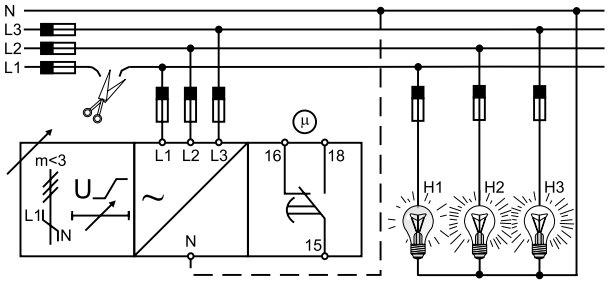
PPB01

Note

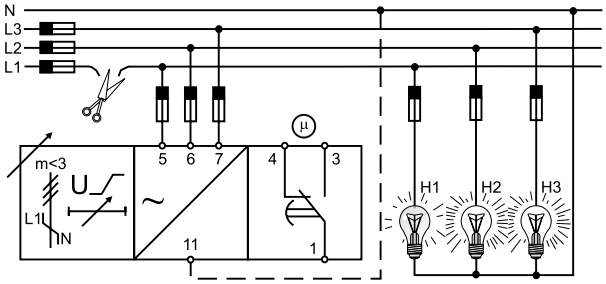
When DPB01 or PPB01 is used with phase indicator lamps (see examples in the following diagrams), the lamp H1 or H2 might be dimly lit when there is a phase loss in L1 or L2. This might happen if the lamps used are the typical low power indicator lamps, and there are no other loads present.

This fact can be avoided by using W4 models. Note that the neutral must be always connected to the device.

DPB01

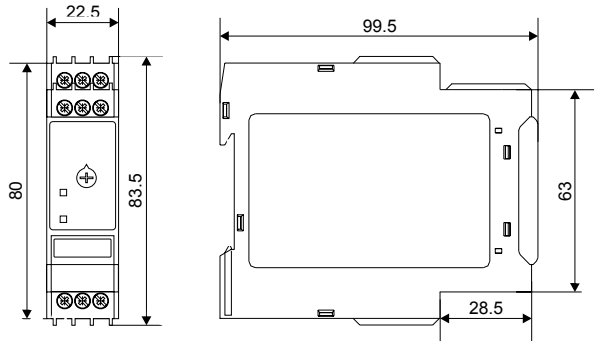


PPB01

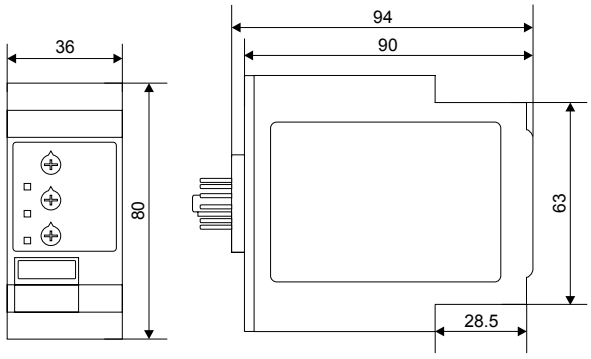


Dimensions

DIN-rail



Plug-in



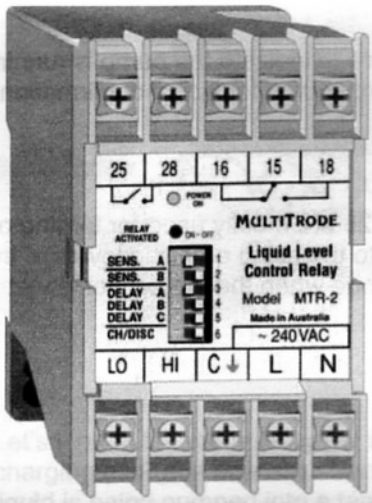
2.7. Multitrode MTR Level Relay

1 Introduction

The MultiTrode level control relay is a solid-state electronic module in a hi-impact plastic case with a DIN rail attachment on the back, making a snap-on-snap-off installation. Any number of relays can be easily added to the DIN metal rail then wired together to form a complex pumping system that other wise may have to be controlled and operated by a programmed PLC.

The relay is normally matched with the MultiTrode probe which works in conjunction with the relay and uses the conductivity of the liquid to complete an electrical circuit.

2 Electrical Overview



There are 10 screw terminals on the unit. Facing the relay as shown, we look at the bottom terminals (left to right):

- Lo – (Charge mode). This is the point when the probe is dry the relay will turn on.
- Lo – (Discharge mode). This is the point when the probe in the tank is dry the relay will turn off.
- Hi – (Charge mode). This is the point when the probe in the tank is wet a relay will turn off
- Hi – (Discharge mode). This is the point when the probe in the tank is wet a relay will turn on.
- C - is common earth. All earth bonding must be terminated here for correct operation.
- " L " is "live" (240V AC)
- " N " is "neutral" (240V AC)

If the tank is plastic, or if you are conducting tests in a plastic bucket, or the vessel has no earth point inside, you must install an earth rod within the tank, vessel or bucket and make sure that it is bonded back to C on the relay unit.

3 DIP Switches

3.1 DIP Switches

(See Wiring Diagram for full program functions.)

3.1.1 DIP 1 & 2

DIP 1 and 2 control the Sensitivity, in other words the cleaner the liquid the higher the sensitivity setting must be. Concentrated acids, minerals are by their own chemical composition highly conductive, so a low level of sensitivity is required, purified water is almost an insulator against electrical current flow so a higher sensitivity inside the relay is required.

3.1.2 DIP 3, 4 & 5

DIP switches 3, 4 and 5, control delay on activation. For example, in discharge mode with DIP switches 3, 4 and 5 set to 10 seconds, when the Hi point becomes wet it will activate the motor and it will take 10 seconds of continual coverage of the probe sensor to make the relay close and start the pump. This is invaluable when the probe is in a turbulent part of a well where fluid is splashing around touching the sensors momentarily, and false activation cannot be tolerated.

3.1.3 DIP 6

DIP switch 6 controls the charge/discharge function. Set "ON" for charge, and "OFF" for discharge

3.2 Relay Contacts & their Applications

3.2.1 Contacts 15, 16 & 18

Contacts 15, 16, and 18 are used for electronic or visual notification of a change in state at the pump itself. Contacts 15, 16, and 18 are used for more advanced applications because they are a changeover relay, their state may be the same as contacts 25, 28 or the opposite. Both sets of contactors are triggered simultaneously. An example is when in discharge mode, (see Figure 1).

You have a gravity flow coming in so the fluid reaches the lower sensor PB1, contacts 15 and 18 are open (15 being common to both contact 16 and 18) contacts 25 and 28 are also normally open but contacts 15 16 in this current situation are closed, whether PB1 is wet or dry is of no concern all will stay the same. The level now rises to PB2 and both relays change state, contacts 25 and 28 close to turn on the pump, contacts 15 and 16 are open, with 15 and 18 closed.

In advanced applications this state change may be fed into a logic device to indicate the pump is running or the pump has stopped and perhaps light an LED or incandescent light source for visual confirmation that a change has occurred in the relay.

3.2.2 Contacts 25 & 28

Contacts 25 and 28 are used to control pump states. Contacts 25 and 28 are mostly used for turning on motors via a starting relay or solenoid, so, these sets of contacts react to the rising or falling levels of the fluid inside the tank, they will operate to turn on a pump in discharge mode when the top sensor is wet and in charge mode turn on the pump when the bottom sensor is dry.

4 Practical Overview

4.1 Discharge Mode – DIP switch 6 set to "OFF"

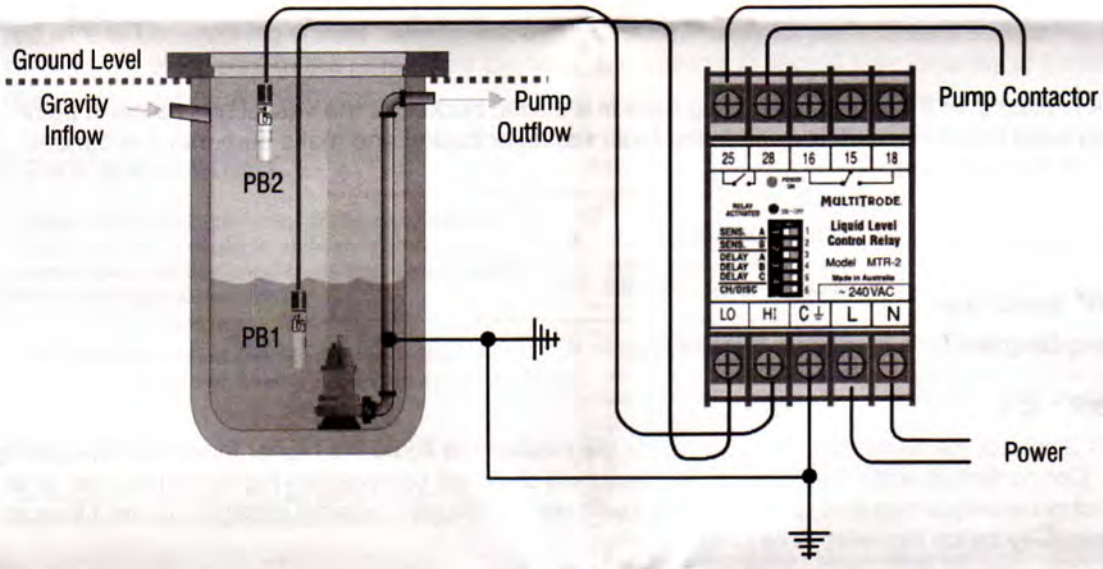
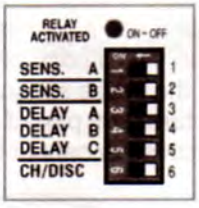


Figure 1 – Discharge Mode

Figure 1 shows two probes, (PB1 connected to Lo and PB2 connected to Hi). The pit is mostly underground and there is a gravity-fed inlet at the top left-hand side. The pit is empty with PB1 completely dry. Dipswitch 6 is set to "OFF."



The relay operation depends on the electrical conductivity of liquid in the pit, i.e. no liquid = no current flow. The level starts to rise and covers PB1.

This is a discharge operation so we do not want the relay to close and start a pump until the well is full so as the water rises it reaches PB2, the relay closes and the pump starts. The level now drops below PB2 but the pump still continues to run, the level continues to drop below PB1 the relay opens the pump stops.

4.2 Charge Mode – DIP switch 6 set to "On"

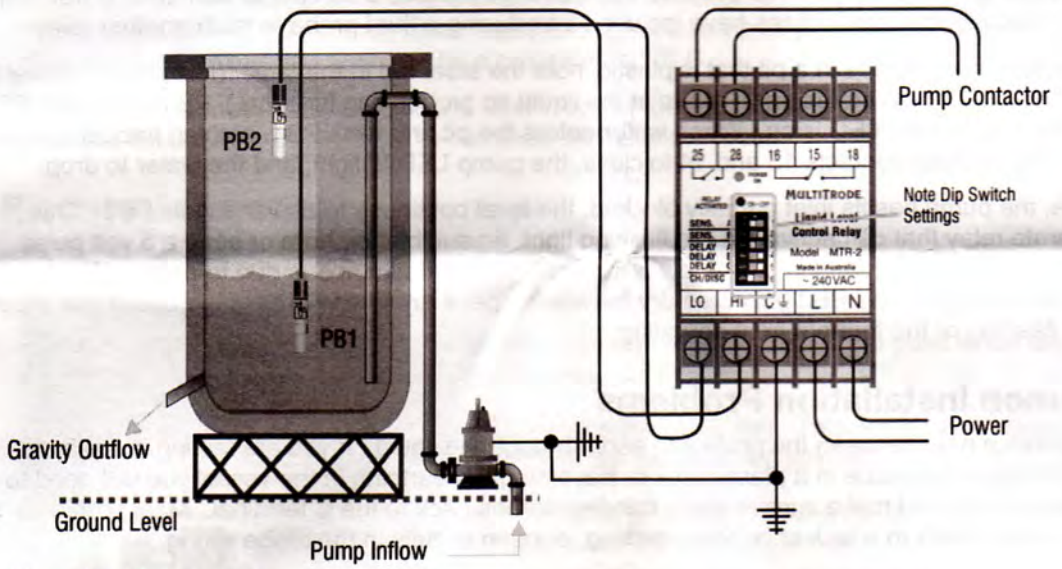


Figure 2 – Charge Mode

Note: "C" is connected to common bonded earth. The unit will not operate correctly if not earthed.

Let's look at the same relay but in a tank that is charging (DIP 6 is now on). See Figure 3, where liquid is being pumped into a tank, and discharging through a gravity feed, the tank is on steel stands "x" metres above the ground.

With the tank full, PB1 and PB2 will be wet, the relay is off, and the pump has stopped. Water is slowly fed out from the bottom, and now as PB2 (HI) becomes dry nothing happens; the water now drops to below PB1 (Lo), and the pumps restarts to fill the tank.

The pump will continue to fill the tank until PB2 (HI), becomes wet again.

4.3 MTRA Relay with Alarm (Discharge Applications Only)

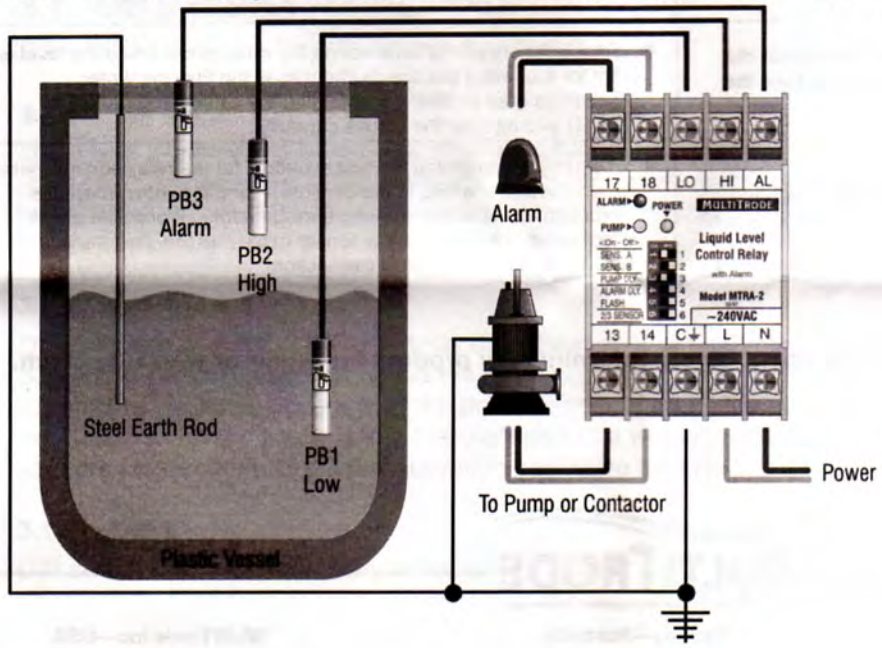


Figure 3 - MTRA Operation

The MTRA relay works in the same way as the MTR relay except the MTRA has a separate alarm output, and does not have a charge mode. The planned application is to close a contact to illuminate a warning alarm light. . Various other applications have included introducing a third probe to latch another relay.

In Figure 2 we see three probes in a pit that is plastic, note the steel rod in the tank. (In a plastic vessel a steel rod must be used to create an earth return in the liquid so probes can function.) PB1, PB2, and PB3 are dry, and the relay power LED is on. When water enters the pit and wets PB1, nothing happens, water now reaches PB2 causing contacts 13 and 14 to close, the pump LED to light, and the water to drop.

If, for example, the pump has its inlet partially blocked, the level continues to rise and wets PB3. This closes a separate relay that can activate a red flashing light, an audible fog horn or send a 5 volt pulse into another device with the common cause to warn human beings that a spill is due to occur. If the pumps become unclogged and PB3 becomes dry the alarm opens again and breaks the circuit that stops the light from flashing or the foghorn from sounding.

5 Most Common Installation Problems

The relay requires a path between the probes to earth through the liquid. If you are testing in a plastic bucket, have installed the probe in a plastic tank or have no good earthing in the vessel you will need to install a separate earth and make sure all earth bonding comes back to the C terminal. Most problems like these are traced back to a lack of or poor earthing, or open circuits in the probe wiring.

Now is the time to check the relay by using "the bridge testing line technique" remember you must simulate a fluid flow to correctly ascertain a good relay or a bad one. (All DIPswitch settings from 1 to 6 should be off.)

Cut two pieces of insulated flexible copper wire one black one red 250 mm long, strip both ends back 10 mm on both cables, and join one black end and one red end. Insert the joined ends into C on the relay box, observing all safe electrical practises. You should have one black wire and one red wire free.

Set your relay for discharge mode (DIP switch 6 is off) with no sensors connected to the unit, connect the red wire to Lo – nothing should happen (if it does return the relay for replacement or repair*). Now connect the black wire to the Hi terminal the relay activated LED should light instantly (if it does not, the relay should be returned for repair*).

6 Troubleshooting

I have checked all the DIPswitches and settings but in discharge mode as soon as the bottom sensor gets wet the pump turns on then turns off almost straight away.	• This is the most common problem encountered with relay set up and commissioning, the probe in the bottom of the tank is wired into the Hi terminal instead of the Lo terminal.
The installation went fine but now and again the pump will not turn on even though I am sure the probe is wet.	• Check the sensitivity level set on the relay, some times the level is set for foul water but due to changes in the flow the water becomes grey or clear, try changing the setting from 20KΩ to 80KΩ and monitor the results carefully.
All wiring is complete and all DIPswitches have been checked but the pump will not turn on at all.	• If you have completed the test schedule for the relay and it passed then check the wiring to the sensors – for this is now where the problem lies or in the earthing arrangements. If possible check the resistance between the sensor cable and the steel sensor on the probe to prove a solid connection.

*** Please contact your distributor or agent before returning any product for repair or warranty claim.**

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2.8. Trio DR900-06A02-D0 Radio

TC-900DR USER GUIDE

41 Aster Avenue Carrum Downs 3201 Australia Tel: 61 3 9775 0505 Fax: 61 3 9775 0606

GENERAL

The Trio DataCom TC-900DR is a full duplex 900 MHz Radio featuring a fully integrated 4800/9600 bps data radio modem and antenna diplexer. Configuration of the unit is fully programmable, with parameters held in non volatile memory (NVRAM). All configuration parameters are accessible using the TC-DRPROG installation package, consisting of a programming lead, manual and software which will run on a PC under Windows 95/98/NT. It is essential that each unit is programmed to suit individual requirements prior to operation. *For detailed information refer to the TC-900DR Handbook.*

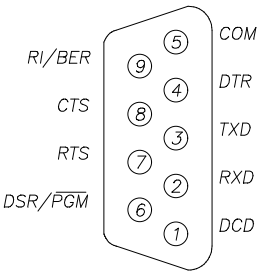
DATA CONNECTION

The data connection is via a DB9 connector labeled 'Port A' (shown below), which is wired as a DCE.

User Serial "Port A" Pin Assignment.

EXTERNAL VIEW OF `**PORT A**

NOTE: Pin 6 and pin 9 provide a dual function which depends on the mode that the TC-900DR is operating in.

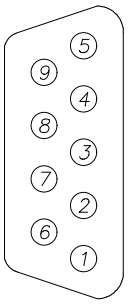


PIN NO. & FUNCTION
1. DATA CARRIER DETECT (DCD)
2. RECEIVE DATA OUTPUT (RXD)
3. TRANSMIT DATA IN (TXD)
4. DATA TERMINAL READY (DTR)
5. COMMON (COM) ___
6. PROGRAM PIN (PGM)
7. REQUEST TO SEND (RTS)
8. CLEAR TO SEND (CTS)
9. BIT ERROR RATE PIN (BER)

User Serial "Port B" Pin Assignment.

Port B can be used as a secondary data steam (independent of Port A) once configured by the programmer. Port B also has one connection that may be of use for installation. This connection (Pin 9) is Receive Signal Strength Indicator (RSSI) output. 0-5V where 1.5V typically indicates -110dBm and every 0.5V increase indicates an improvement of » 10dBm.

EXTERNAL VIEW OF `**PORT B'**



PIN NO. & FUNCTION
1. DATA CARRIER DETECT (DCD)
2. RECEIVE DATA O/P (RxD)
3. TRANSMIT DATA O/P (TxD)
4. UNUSED
5. COMMON
6. DATA SET RECEIVE (DSR)
7. UNUSED
8. UNUSED
9. RECEIVE SIGNAL STRENGTH

NOTE: Port B Pin 9 output has a high impedance of around 50K OHMS and loading will decrease accuracy of the RSSI measurement.

POWER CONNECTIONS

The power required is 13.8VDC nominal, at 600mA (Tx) nominal. If the POWER LED indicator is not illuminated once power is applied, check the internal 1Amp fuse fitted within the unit.

POWER CONNECTOR	PIN ASSIGNMENT
TOP PIN	***+VE SUPPLY (13.8vdc)***
BOTTOM PIN	***GROUND***

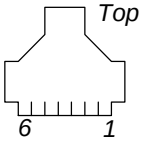
Ext. view of socket

AUXILIARY CONNECTOR

The auxiliary connector is primarily for use with the optional audio handset. The connections to this auxiliary 6 pin RJ11 connector are as follows:

PIN NUMBER	FUNCTION
1	***8 VOLTS***
2	***AUDIO OUT***
3	***GROUND***
4	***MIC INPUT/SENSE***
5	***GROUND***
6	***MANUAL PTT***

External view of socket



The optional audio handset is recommended as an aid in checking installations for radio path viability. This audio handset will only function when fitted prior to applying power to the unit.

The modem upon power up will check the presence of the handset and will inhibit data being transmitted so that voice communications can be established.

Once the path tests have been conducted the audio handsets **MUST be REMOVED** and the unit powered up with the handset removed before data communication can commence.

USER INDICATIONS

The TC-900DR provides 4 LED's that show status information to the user - POWER, RXSIG, SYNC, and TXMIT indications.

The POWER is indicated by a green LED and simply signifies that power has been applied to the unit.

The RXSIG LED (yellow) indicates the level of RSSI signal from the radio IF strip, compared to a threshold level set in the configuration data programmed by the user. If the signal is above the threshold, then the LED indicator is turned on.

In all operation modes except "Programmer mode", the SYNC LED (yellow) indicates when the modem has detected a valid data stream. The SYNC LED is activated, when the modem detects a valid HDLC flag sequence, and remains active until an invalid sequence of seven or more consecutive "1" bits is detected.

The SYNC LED will not be turned on if the RSSI signal strength (as indicated by the RXSIG LED) is below the minimum threshold. This prevents false SYNC detection from noise.

The TXMIT LED (red) indicator is connected directly to the modem's PTT output transistor. Whenever the radio is transmitting, this TXMIT LED indicator will be on.

SPECIAL MODES OF OPERATION

Part of the power-up/reset initialisation phase of the TC-900DR are tests to determine if the modem should enter one of 3 "special operation" modes. I*n these modes the TC-900DR won't operate in its standard run mode.*

- Programmer mode.
- Bit error rate test mode.
- Handset mode.

These modes are only entered if the required setup conditions are present at power up. An error mode of operation can also be entered into, if during normal operation, an error condition occurs.

PROGRAMMER MODE

CABLE - Pins 2, 3, 4, 5 straight through with Pin 6 on the DB9 connector of Port A, connected to pin 5. When the modem is powered up with this fitted, the controller senses this and attempts to enter "Programmer mode" and the "SYNC" LED will flash approx. once per second. (Note, the TC-DRPROG programming software and lead has the required connections). Failure to supply the correct password in time, will cause the modem to abandon the "Programmer mode" attempt, and go on with it's normal power-up procedure.

BIT ERROR RATE TEST MODE

Pin 9 of the DB9 connector of Port A, is normally the Ring Indicate output line. However, if this pin is driven positive (connecting it to pin 6 [DSR] and pin 7 [RTS]), then the modem's data transmitter and receiver will enter the BER test mode. This will activate the RF transmitter, and generate a scrambled bit pattern which should be decoded at a receiver as a constant logic "1" level in the unscrambled data. Any errors in the decoded bitstream, will be "0", and the receiver portion of the modem in this mode, will activate the SYNC LED every time it sees a "0" bit.

Note: As the TC-900DR is full duplex this test can operate in both directions simultaneously.

Every error bit detected, will activate the SYNC LED. For error rates of 1 in 10^3 and above, the SYNC LED will be ON most of the time. A 1 in 10^4 error rate will show the SYNC LED active for approximately 10% of the time. This function provides a crude indication of Bit Error Rate for installation purposes. Note: Error count messages (ET:XXXX) for every 10,000 bits are presented to Port A for the user. If pin 9 ceases to be driven positive, then the BER Test mode is terminated, and the modem restarts it's initialisation phase.

HANDSET MODE

The DFM4-9 modem tests for the presence of a handset plugged into the handset auxiliary port at power up. If a handset is plugged in, the modem will not generate a data stream. However, it will continue to indicate received RF signal strength. The handset has a PTT button, and this signal is connected across the modem's PTT output. Thus the handset PTT switch will activate the TXMIT LED. It is essential to remove the handset from the unit and reapply power to the unit in order to return to normal operation.

ERROR INDICATION MODES

There are 3 error conditions that cause the RXSIG & SYNC LEDs to be used for error indications and not their normal purpose. Two are fatal conditions, that cause the modem to restart after the duration of the error indication phase.

TRANSMIT POWER LOW

While the modem activates the radio transmitter, it periodically checks the transmit power. If the power measurement is less than a threshold set in the non-volatile memory, then the RXSIG and SYNC LEDs are made to alternate, approximately 4 times per second. The TXMIT LED will also be on during this process. This indication condition will persist for the duration of the transmission. As soon as the transmission is discontinued, the error indication will cease, and the two LEDs revert to their normal function. Factory set to 100 milliWatts.

NVRAM READ ERROR

The DFM4-9DR modem accesses the non-volatile memory as part of it's initialisation phase, to read programming configuration data. If the communication protocol with the device is violated, or the non-volatile memory CRC checksum is found to be incorrect, then the modem indicates this by flashing the RXSIG and SYNC LEDs twice alternately. That is, one LED operates ON and OFF twice, then the other. A total of five cycles of this occurs, then the modem restarts initialisation.

SYNTHESISER LOCK DETECT ERROR

If at any time during normal operation, BER mode, or handset mode, the TBB206 frequency synthesiser indicates an out of lock condition, the modem enters an error indication mode for a short time before restarting.

One LED is turned ON (☼), the LEDs are swapped, then both turned OFF (●). Then the latter LED ON again, swap LEDS, and then OFF. This will give the appearance of a sweeping motion between the LEDs. The following table shows all error condition displays.

Tx PWR Err		NVRAM Err		SYNTH Err	
RXSIG	SYNC	RXSIG	SYNC	RXSIG	SYNC
☼	●	☼	●	☼	●
●	☼	●	●	●	☼
☼	●	☼	●	●	●
●	☼	●	●	●	☼
☼	●	●	☼	☼	●
●	☼	●	●	●	●
☼	●	●	☼		repeat
●	☼	●	●		
continue			repeat		

MOUNTING AND ANTENNA CONNECTION

The TC-900DR should be mounted in a cool, dry, vibration free environment, whilst providing easy access to screws and connections. There are 4 mounting holes on the unit. The antenna should be an external yagi antenna but can be a ground independent dipole mounted via a feeder to the antenna connector (SMA type) for short range applications. However the whole radio modem should be clear of the associated data equipment to prevent mutual interference.

ASSEMBLY OF POWER LEAD

A small plastic bag containing a molex connector (M5557-2R) and two pins (M5556-TL) is provided in the packing box.

The pins are designed to take 18-24 (AWG) wire size with insulation range 1.3 - 3.10mm.

Please take care when crimping the pins. 04/01

2.9. Multitrode Level Probe

The MultiTrode Probe

MultiTrode probes are unsurpassed for rugged reliability, cost effectiveness and simplicity. Designed for the tough, turbulent conditions found in water, sewage and industrial tanks and sumps, the probes can be found in the simplest and the most complex water and wastewater management systems around the world.

- Low maintenance
- Simple installation
- Excellent in turbulence
- Short & long term cost savings
- Environmentally friendly
- Safe, low sensing voltage
- Unaffected by fat, grease, debris and foam
- Positive pump cut-out
- Safe – MTISB Barrier

Reliable in all conditions

Operation is unaffected by build up of fat, grease debris and foam, which causes other systems such as floats, bubblers, pressure and ultrasonic transducers to fail. Turbulence does not affect the probe operation. The rugged, streamlined design eliminates tangling and is ideal for confined spaces.

Positive pump cut-out

Operational consistency is important to longevity, low maintenance and cost control. The positive pump cut-out ensures pumps are turned off at the same level every time. This avoids damage due to pump over run and the cost of additional control equipment.

Safe for people and environment

The extra low sensing voltage ensures operators and maintenance staff are protected. All MultiTrode products are environmentally safe, containing no mercury or other harmful contaminants.

Cost savings

The low cost of equipment, installation and maintenance makes MultiTrode one of the most efficient level control systems available. Plus robust construction and longevity ensures continued cost savings when compared to other systems on the market.

Standard and custom probes

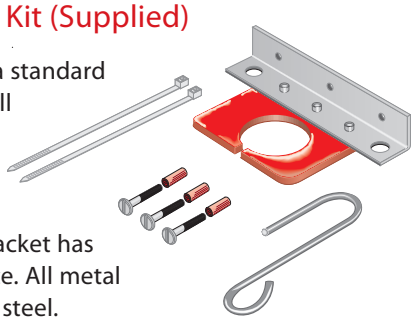
MultiTrode manufactures a wide range of standard probes, from a single sensor (200mm) to a ten-sensor probe (1000mm increasing to a maximum of nine metres). Custom probes can be manufactured to suit your requirements.

Installation

Installation is straightforward. Probes are easy to install without entering the wet area. The probe is simply lowered in from the top and suspended by its own cable, using the mounting kit supplied.

MTAK-1 Mounting Kit (Supplied)

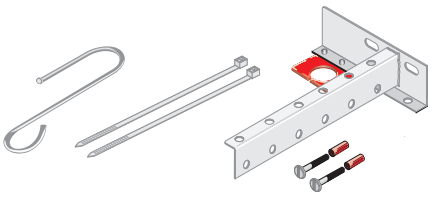
The mounting bracket is a standard accessory supplied with all multi-sensor probes (not standard with 0.2/1-xx single sensor probe).



The MTAK-1 mounting bracket has an integral cleaning device. All metal components are stainless steel.

MTAK-2 Mounting Kit (Optional extra)

This extended bracket provides up to 300mm extra wall clearance. This bracket is not included as standard with probes.



Ordering Examples and Information

Model Code	Probe Length (m/in)	Sensor Separation (mm/in)	Cable Length* (m/ft)	Number of Sensors
0.2/1-10	0.2/8	N/A	10/33	1
0.5/3-10	0.5/16	150/6	10/33	3
1.0/10-10	1/40	100/4	10/33	10
1.5/10-30	1.5/60	150/6	30/100	10
2.0/10-30	2/80	200/8	30/100	10
2.5/10-30	2.5/96	250/10	30/100	10
3.0/10-30	3/115	300/12	30/100	10
6.0/10-30	6/224	600/24	30/100	10
9.0/10-30	9/368	900/40	30/100	10

*Cable Length 10m/33ft or 30m/100ft

Probe Length (meters)	Sensor Points	Cable Length (meters)
2.5	10	10

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MultiTrode Probe Immersion Table

multitrode
WATER • WASTEWATER • PUMP STATION • TECHNOLOGY

PVC and AVESTA 254-SMO stainless steel comprise the major, exposed surfaces of the MultiTrode probe, and have been operated and tested in the following chemicals.

ACETIC ACID	50% Aqueous
ADIPIC ACID	Saturated Aqueous
ALUMINIUM SULPHATE	27%
AMMONIUM CARBONATE	50% Aqueous
AMMONIUM HYDROXIDE	All Concentrations
AMMONIUM PHOSPHATE	All Concentrations
AMMONIUM SULPHATE	All Concentrations
AMMONIUM SULPHIDE	All Concentrations
AMYL ALCOHOL	
ANILINE HYDROCHLORIDE	All Concentrations
BARIUM HYDROXIDE	All Concentrations
BEER	
BORAX	All Aqueous
BORIC ACID	All Aqueous
CALCIUM NITRATE	50% Aqueous
CHLORIC ACID	10%
CHROMIC ACID	5%
FORMIC ACID	Up to 50% Aqueous
GELATINE	All Concentrations
GLUCOSE	All Concentrations
GLYCERINE	All Concentrations
HYDROBROMIC ACID	50% Aqueous
HYDROCYANIC ACID	100%
HYDROFLUORIC ACID	1%
HYDROGEN PEROXIDE	30% Aqueous
HYDROGEN SULPHIDE	Moist Gas or Saturated Aqueous solution
LACTIC ACID	18% Aqueous
LEAD ACETATE	All Concentrations
MERCURY	100%
MILK	Sour
NITRIC ACID	Up to 40% Aqueous

OXALIC ACID	5%
PHOSPHORIC ACID	Up to 30% Aqueous
POTASSIUM BICHROMATE	25%
POTASSIUM CHLORATE	36%
POTASSIUM CHROMATE	All Concentrations
POTASSIUM CYANIDE	All Concentrations
POTASSIUM PERMANGANATE	5-10%
POTASSIUM PERSULPHATE	Saturated
POTASSIUM SULPHATE	All Concentrations
SODIUM ACETATE	All Concentrations
SODIUM BICARBONATE	All Concentrations
SODIUM BISULPHATE	5%
SODIUM BISULPHITE	10%
SODIUM CHLORATE	30%
SODIUM FLUORIDE	5-10%
SODIUM NITRATE	All Concentrations
SODIUM PHOSPHATE	All Concentrations
SODIUM SILICATE	All Aqueous
SODIUM SULPHATE	All Concentrations
SODIUM SULPHIDE	5%
SODIUM SULPHITE	50%
SODIUM THIOSULPHATE	16-25%
SULPHUR DIOXIDE	Technically Pure Anhydrous
SULPHURIC ACID	98%
SULPHUROUS ACID	Saturated Aqueous
TANNIC ACID	All Aqueous
TARTARIC ACID	All Aqueous
TURPENTINE OIL	Technically Pure
VINEGAR	4-5%
YEAST	All Aqueous

Unless stated otherwise, all aqueous solutions are 100%.

Note: MultiTrode probes can be used in many other aggressive applications and the list above is by no means complete.

Materials:

Sensors:	Avesta 254 SMO high grade stainless steel alloy	
Casing:	uPVC premium quality extruded tube	
Cable:	PVC/PVC multi-core, purpose-manufactured	
Resin:	Fast cure, low viscosity, and solvent free	
	Compressive Strength (TM-45) 7 days at 25°C (77°F)	= 60 N/mm^2
	Elastic Modulus in Compression (TM-45) 7 days at 25°C	= 60 N/mm^2
	Flexural Strength (TM-46) 7 days at 25°C (77°F)	= Specimen did not break under test
	TG (TM-22) 7 days at 25°C (77°F)	= 30°C (86°F)
Dimensions:	32 mm (1 ¼ in) diameter x specified length	
Mounting:	via the supplied suspension/cleaning bracket inside the wet well	

** Mounting bracket not supplied with single-sensor probes*

Environmental Range: 0°C to +65°C (32°F to +149°F)

Cable:	10-core	3-core	Single-core
Conductor Size	0.75mm^2	0.75mm^2	1.00mm^2
Strands/Conductor	24	24	30
Ohms/km	25	25	20
Ohms/mile	40	40	32

** Other multi-core cables are available for non-standard probes*

Oversheath:	10-core	3-core	Single-core
Nominal diameter	11.2 mm	6.8 mm	6.8 mm
Core Colours:	White *	White *	White
Oversheath:	Blue		

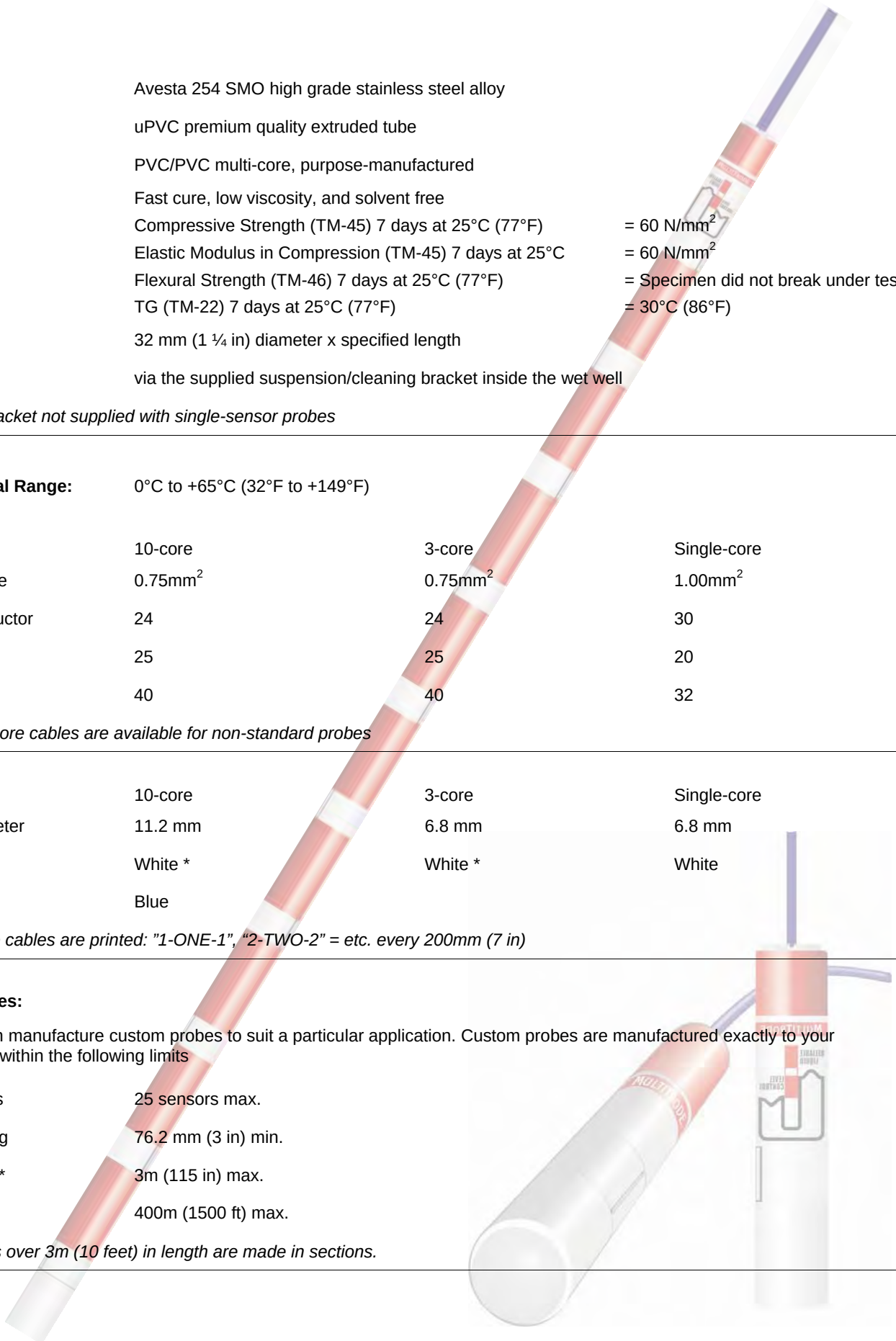
** All multi-core cables are printed: "1-ONE-1", "2-TWO-2" = etc. every 200mm (7 in)*

Custom Probes:

MultiTrode can manufacture custom probes to suit a particular application. Custom probes are manufactured exactly to your requirements, within the following limits

No. of Sensors	25 sensors max.
Sensor spacing	76.2 mm (3 in) min.
Section length*	3m (115 in) max.
Cable length	400m (1500 ft) max.

** Note: Probes over 3m (10 feet) in length are made in sections.*



3. Drawings

3. Drawings

3.1. Point to Point Drawings

3.2. Tested Drawings

QUEENSLAND
Urban Utilities

PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE SWITCHBOARD

	VARIABLE / LAYER	VALUE / ON or OFF			
DRAWING VARIABLE	PRV No. (01)	PRV154			
	StreetName (02)	CORDELIA ST			
	SuburbName (03)	SOUTH BRISBANE			
	Pin Gauge No. (04)	-			
	Pout Gauge No. (05)	-			
	Flowmeter No. (06)	-			
	RadioPartNo. (07)	ER450-53A02-EH0			
	DrawingNo. (08)	486/4/9-0954-			
	Site Function (09)	PRESSURE REGULATING VALVE			
	SPARE (10)	----			
DRAWING LAYER	1.1 Main PRV fitted	yes	Yes	No	No
	1.2.1 Bypass PRV fitted	no	No	No	No
	2.1 Radio fitted	yes	Yes	No	No
	2.1.1 Side Antenna Mast fitted	yes	Yes	No	No
	2.1.2 Rear Antenna Mast fitted	no	No	No	No
	3.1 PSTN Modem fitted	no	No	No	No
	3.2 GSM Modem fitted	no	Yes	Yes	Yes
	4.1 Flowmeter fitted	yes	Yes	No	Yes
	5.1.1 Pressure Guage 1 fitted	yes	Yes	Yes	Yes
	5.2.1 Pressure Guage 2 fitted	yes	Yes	No	Yes
	6.1 Sump Pump fitted	yes	Yes	No	No
	7.1 RTU - MD331 fitted	no	No	No	No
	7.2 RTU - eNet fitted	yes	Yes	Yes	Yes
	7.3 RTU plg/skt fitted	yes	Yes	Yes	Yes

PRESSURE REGULATING VALVE
PRESSURE GAUGE
FLOWMETER

ELECTRICAL DRAWINGS INDEX

DWG N°.	TITLE	SHEET	REVISIONS				
486/4/9-0954-001	ELECTRICAL DRAWING INDEX	01	0	1			
486/4/9-0954-002	POWER DISTRIBUTION SCHEMATIC DIAGRAM	02	0	1			
486/4/9-0954-003	DIGITAL INPUTS AND OUTPUTS TERMINATION DIAGRAM	03	0	1			
486/4/9-0954-004	ANALOG INPUTS AND OUTPUTS TERMINATION DIAGRAM	04	0	1			
486/4/9-0954-005	PRV SWITCHBOARD GENERAL ARRANGEMENT	05	0	1			
486/4/9-0954-006	SWITCHBOARDS CONSTRUCTION DETAILS	06	0	1			
486/4/9-0954-007	PRV SWITCHBOARD EQUIPMENT LIST	07	0	1			
486/4/9-0954-008	SWITCHBOARD CABLE & LABEL SCHEDULE	08	0	1			
486/4/9-0954-009	SOLAR PANEL SWITCHBOARD GENERAL ARRANGEMENT	09	A	0			
486/4/9-0954-010	SITE OVERALL LAYOUT	010	A	0			
486/4/9-0954-011	HALE STREET SOLAR PANEL SWITCHBOARD	011	A	0			

NOTE:
EXISTING SWITCHBOARD TO BE INSTALLED

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SJ ELECTRIC QUEENSLAND

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(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

QUEENSLAND Urban Utilities

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CONSTRUCTION W.O. No.
FUNDED BY Q.U.U. (✓) EXTERNAL ( )

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ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
ELECTRICAL DRAWING INDEX

SHEET No. 1 OF 1
QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-001
AMEND. 1

ENERGEX UNMETERED SUPPLY
240VAC 10kA MAX
N L

EARTH STAKE

EARTH
MEN LINK
NEUTRAL

IP30 COVER

Q1
16A

LABEL "MAIN SWITCH"

101

2A
Q2

102
102N
102E

LAPTOP OUTLET
30mA RCD

OUTLET LABEL:-
LAPTOP ONLY - 2A

SURGE FILTER
6A 275VAC
CRITEC DINLINE DSF-6A-275

IP30 COVER

6A
Q3

103
103N
103E

SF1
L1
N
E
L2
N2

103A

4A
Q4

104
SN1
104E

SURGE DIVERTER
230V 45kA
TITAN DR1P45K230DC

SD1
L
E
COM
NC

CLOSED=HEALTHY

SURGE PROTN ALARM RLY
240VAC
CRITEC SAR-275V

2A
Q5

105
SN1
SPR1
SPR3

SAR
L
N
COM
NO
+
-

CLOSED=HEALTHY

RTU "SURGE PROTECTION OK" INPUT
REFER SHEET 03:E6

POWER FAIL RELAY
240VAC
FINDER 38.51240VAC

2A
Q6

106
106N

PFR
L
N
COM
NO

CLOSED=HEALTHY

RTU "MAINS POWER OK" INPUT
REFER SHEET 03:E6

6A
Q7

RTU POWER SUPPLY
10A 24VDC
POWER BOX PB251-24CM

PS1
LOAD
BATT
BOK
RTU
COM
NC

RTU "BATTERY OK" INPUT
REFER SHEET 03:D6
0=FAULT, 1=HEALTHY

RTU "RTU POWER OK" INPUT
REFER SHEET 03:D6
0=FAULT, 1=HEALTHY

L
N
E

24VDC SUPPLY
FROM SOLAR CUBICLE

Q7
20A
16A

J2A+
J2A-
2-
Q8

5AMP
J3+
3+
J3-
3-

24V DC
13.8V DC

J4A+
J4A-

5AMP
4+
4-
J4+
J4-

RADIO
B
A

X01
SD2
X02
X03

Rx TBA
Tx TBA

5AMP
J5+
5+
J5-
5-

2-17
2-18

J5+
J5-

J13+
J13-

5AMP
J6+
6+
J6-
6-

RTU 24VDC
CARD SUPPLY

5AMP
J7+
7+
J7-
7-

PIT FLOODED
LEVEL RELAY K1

5AMP
J8+
8+
J8-
8-

LEVEL CONTROL
RELAY K2

5AMP
J9+
9+
J9-
9-

MAIN
ACTUATOR

5AMP
J10+
10+
J10-
10-

FLOWMETER

5AMP
11+
11-

SPARE RESERVED FOR
BYPASS
ACTUATOR

5AMP
12+
12-

SPARE RESERVED FOR
GSM
MODEM

5AMP
J14+
14+
J14-
14-

CABINET
LIGHT

5AMP
J15+
15+
J15-
15-

MTR
K2
PUMP INHIBIT
K4
PUMP RUN
K3
107
108
K3
109

SUMP
PUMP

REFER
SHEET 03

NOT USED

DC IN
DC OUT
PORT 0
PORT 1
PORT 2
RADIO
LANLINE

PDS COMPACT
eNET SERIES RTU

ETHERNET
INPUTS
OUTPUTS
DIAGNOSTICS

REFER
SHEET 04

REFER
SHEET 04

REFER
SHEET 03

REFER
SHEET 03

REF: H8
J14+
J14-
DS1A
106A
CABINET LIGHT
CLOSED = OPEN DOOR

CABLE X03 TERMINATION DIAGRAM
eNet RTU -------- TRIO RADIO

White RJ11-1	DB9-M-1
Black RJ11-2	DB9-M-2
Red RJ11-3	DB9-M-3
Green RJ11-4	DB9-M-4
Yellow RJ11-5	DB9-M-5
Blue RJ11-6	DB9-M-6
	DB9-M-7
	DB9-M-8
	DB9-M-9

1

LEGEND:

- ▲ SWITCHBOARD POWER TERMINAL
- ⌀ SWITCHBOARD CONTROL TERMINAL
- ⊠ FIELD DEVICE TERMINAL
- ⊠ FIELD MARSH. PANEL TERMINAL
- ◧ PLC TERMINAL
- ◪ RTU TERMINAL
- ■ VFD TERMINAL
- ● PLC/RTU MARSH. FUSE TERMINAL
- ○ PLC/RTU MARSH. LINK TERMINAL
- DI1-02 RTU DIGITAL INPUT
- DO1-02 RTU DIGITAL OUTPUT
- AI1-02 RTU ANALOGUE INPUT
- AO1-02 RTU ANALOGUE OUTPUT

NOTES

1. CIRCUIT BREAKERS SHALL BE SHROUDED.
2. FAULT LEVEL OF 10kA AT 240V FOR 0.2sec.
3. ALL FUSES ARE 500mA EXCEPT WHERE NOTED OTHERWISE.
4. INSTRUMENT EARTH SHALL BE SEPARATED FROM PROTECTIVE EARTH.

PT TO PT & FUNCTION
8/3/12 113407
GLENN BACON
Glenn Bacon

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QUEENSLAND UrbanUtilities

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CONSTRUCTION MANAGER SIGNATURE DATE

ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
POWER DISTRIBUTION
SCHEMATIC DIAGRAM

SHEET No. 1 OF 1
QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-002
AMEND. 1

PT TO PT & FUNCTION
8/3/12 113407
GLENN BACON

SWITCHBOARD | FIELD

DC PWR

TO BATTERY SEE SHEET 02 — J1A+, J1A-
J2A+, J2A-
13.8VDC SUPPLY FROM CONVERTER - SEE SHEET 02 — J4A+, J4A-

(10A)	1+ / 1-	J1+ / J1- FROM 240VAC/24VDC POWER SUPPLY
(10A)	2+ / 2-	J2+ / J2-
(5A)	3+ / 3-	J3+ / J3- TO 24/13.8VDC CONVERTER FOR RADIO
(5A)	4+ / 4-	J4+ / J4- 13.8VDC SUPPLY TO RADIO
(5A)	5+ / 5-	J5+ / J5- 24VDC TO RTU E3 CONNECTOR
(5A)	6+ / 6-	J6+ / J6-
(5A)	7+ / 7-	J7+ / J7- MULTITRODE RELAY K1
(5A)	8+ / 8-	J8+ / J8- MULTITRODE RELAY K2
(5A)	9+ / 9-	J9+ (3W) / J9- (3Bk) TO MAIN ACTUATOR
(5A)	10+ / 10-	J10+ / J10- TO FLOWMETER
(5A)	11+ / 11-	SPARE - RESERVED FOR BYPASS ACTUATOR
(5A)	12+ / 12-	SPARE - RESERVED FOR GSM MODEM
(5A)	13+ / 13-	SPARE - RESERVED FOR PSTN MODEM
(5A)	14+ / 14-	J14+ / J14- CABINET LIGHT
(5A)	15+ / 15-	J15+ / J15- SUMP PUMP

REFER TO SHEET 02

RTU eNET REFER SHT 02

DIGITAL INPUTS

1	DI00	1-01	DI1-COM
2	DI01	1-02	DI00
3	DI02	1-03	DI01
4	DI03	1-04	DI02
5	DI04	1-05	DI03
6	DI05	1-06	DI04
7	DI06	1-07	DI05
8	DI07	1-08	DI06
COM		1-09	DI07
9	DI08	1-10	DI08
10	DI09	1-11	DI09
11	DI10	1-12	DI10
12	DI11	1-13	DI11
13			
14			
15			
16			
COM	DI1-COM		

DI1

(2A)	16	J6+ / J6-	
	17	DI00+ / DI00-	BOK — BATTERY SYSTEM OK
	18	DI01+ / DI01-	RTU — RTU POWER OK
	19	DI02+ / DI02-	DS1B — SOLAR PANEL SWITCHBOARD DS2B — SECURITY - DOOR STATUS CLOSED = DOOR CLOSED
	20	DI03+ / DI03-	
	21	DI04+ / DI04-	K3 — SUMP PUMP RUNNING
	22	DI05+ / DI05-	PFR — MAINS POWER OK
	23	DI06+ / DI06-	SAR — SURGE PROTECTION OK
	24	DI07+ / DI07-	
	25		
	26		
	27		
	28		

DIGITAL OUTUTS

DO1	NC COM NO	DO1+24V	1-14
DO2	NC COM NO	DO0	1-15
DO3	NC COM NO	DO1	1-16
DO4	NC COM NO	DO2	1-17
DO5	NC COM NO	DO3	1-18
DO6	NC COM NO	DO4	1-19
DO7	NC COM NO	DO5	1-20
DO8	NC COM NO		

DO1

(2A)	29	J6+ / J6-	
	30	DO00+ / DO00-	K4 — PUMP INHIBIT RELAY
	31		
	32		
	33		
	34		
	35		

J6+ / J6- — 24VDC SUPPLY CONT'D ON SHEET 04

CONT'D ON SHT 04 | CONT'D ON SHT 04

DI03+ / DI03- — 25 | 28 | 16 | 15 | 18 — PIT FLOODED RELAY K1
MULTITRODE MTR5 24VDC — LO | HI | C | + | −
J1+ / J1- — 24VDC REF 0386
DI03B — C06 — SUMP LEVEL HIGH HIGH ELECTRODE

C07 — DI07+ RPV / DI07- — RTU PILOT VALVE ACTIVE

SENSOR INSTALLATION TBC ON SITE
C08 — SUMP LEVEL HIGH ELECTRODE
C09 — SUMP LEVEL LOW ELECTRODE

MTR K2 REF 02349
25 | 28 | 16 | 15 | 18 — LEVEL CONTROL RELAY K2
MULTITRODE MTR5 24VDC — LO | HI | C | + | −
J8+ / J8- — 24VDC REF 0386
C08A
C09A

NOTES

1. CIRCUIT BREAKERS SHALL BE SHROUDED.
2. FAULT LEVEL OF 10kA AT 240V FOR 0.2sec.
3. ALL FUSES ARE 500mA EXCEPT WHERE NOTED OTHERWISE.
4. INSTRUMENT EARTH SHALL BE SEPARATED FROM PROTECTIVE EARTH.

LEGEND:

- ▲ SWITCHBOARD POWER TERMINAL
- ⌀ SWITCHBOARD CONTROL TERMINAL
- ⊠ FIELD DEVICE TERMINAL
- ⊠ FIELD MARSH. PANEL TERMINAL
- ◧ PLC TERMINAL
- ◪ RTU TERMINAL
- ■ VFD TERMINAL
- ● PLC/RTU MARSH. FUSE TERMINAL
- ○ PLC/RTU MARSH. LINK TERMINAL
- DI1-02 RTU DIGITAL INPUT
- DO1-02 RTU DIGITAL OUTPUT
- AI1-02 RTU ANALOGUE INPUT
- AO1-02 RTU ANALOGUE OUTPUT

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APPROVED BY SIGNATURE DATE
. .
CONSTRUCTION MANAGER SIGNATURE DATE

ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
DIGITAL INPUTS AND OUTPUTS TERMINATION DIAGRAM

SHEET No. 1 OF 1
QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-003
AMEND. 1

SWITCHBOARD

FIELD

CONT'D FROM SHT 03

RTU
eNET

ANALOG INPUTS

AI1

AI1+24V

24VDC SUPPLY CONT'D FROM SHT 03

A100A W
A101A W
A100B Bk
A101B Bk
A102A W
A102B Bk
A103A W
A103B Bk

C01

C02

C03

C03A

C05

C04

INLET PRESSURE
E+H PMC131

OUTLET PRESSURE
E+H PMC131

E+H PROMATIC 10
FLOWMETER Tx

E+H PROMATIC 10
FLOWMETER SENSOR

24VDC SUPPLY
REFER 03:B6

SIGNAL CONVERTER
WIRING TBC

PYRANOMETER

0-350mV

ANALOG OUTPUTS

A01

A000A
A000B

REFER 03:B6
24VDC SUPPLY

PRV154
MAIN ACTUATOR
SINGER 160-420DC

IP67 J-BOX

Pt to Pt & Function
8/3/12 113407
Glenn Bacon
Glenn Bacon

LEGEND:

- SWITCHBOARD POWER TERMINAL
- SWITCHBOARD CONTROL TERMINAL
- FIELD DEVICE TERMINAL
- FIELD MARSH. PANEL TERMINAL
- PLC TERMINAL
- RTU TERMINAL
- VFD TERMINAL
- PLC/RTU MARSH. FUSE TERMINAL
- PLC/RTU MARSH. LINK TERMINAL
- DI1-02 RTU DIGITAL INPUT
- DO1-02 RTU DIGITAL OUTPUT
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- AO1-02 RTU ANALOGUE OUTPUT

NOTES

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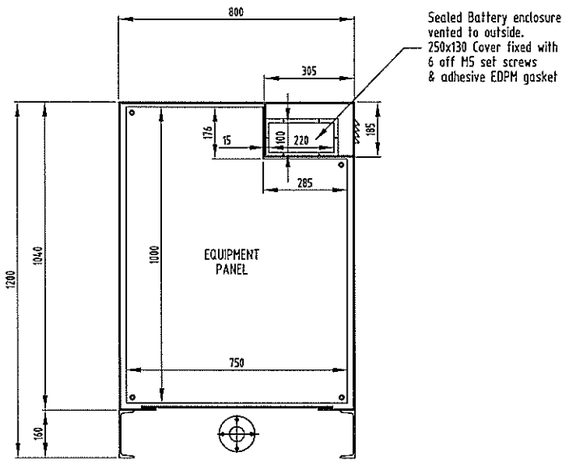
CONSTRUCTION MANAGER SIGNATURE DATE

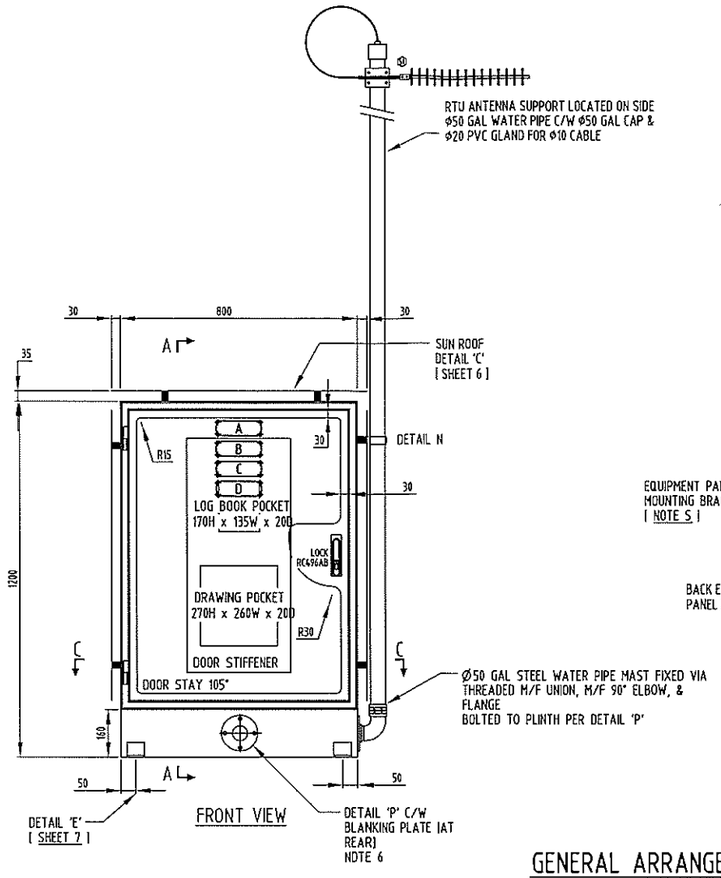
ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
ANALOG INPUTS AND OUTPUTS
TERMINATION DIAGRAM

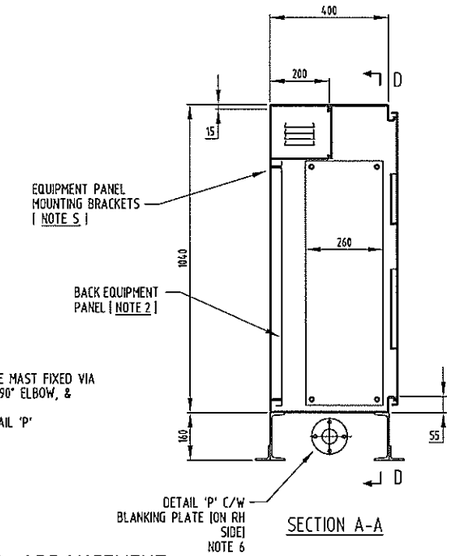
SHEET No. 1 OF 1
QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-004
AMEND. 1



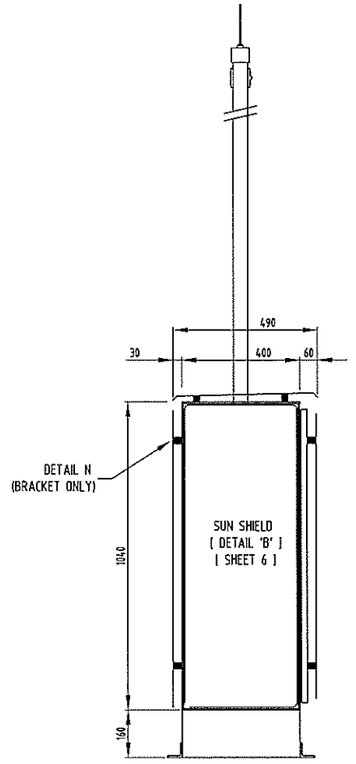
SECTION D-D
[REFER DRG SHT 07]



FRONT VIEW



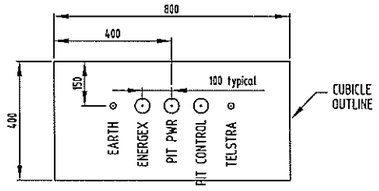
SECTION A-A



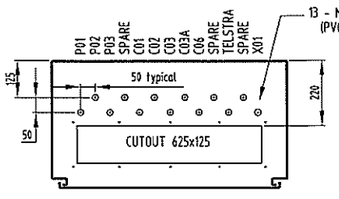
LEFT VIEW

GENERAL ARRANGEMENT

SCALE: 1/10 ON A1 SIZE PRINT

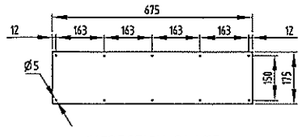


SLAB CONDUIT LOCATIONS
Ø25 & Ø50 PVC CONDUITS



FLOOR CUTOUTS
FOR CABLE ENTRY & INSPECTION ACCESS

SECTION C-C



INSPECTION PLATE
3mm AL + GASKET + M4 SCREWS

NOTES:

1. REFER TO SHEET 06 FOR THE SWITCHBOARD CONSTRUCTION DETAILS.

2. SIDE & BACK EQUIPMENT PANELS TO BE MOUNTED 40mm OFF THE SIDE & BACK WALLS AND OPEN AT BOTH THE TOP AND BOTTOM TO ALLOW FOR AIR FLOW.

3. REFER TO SHEET 07 FOR THE EQUIPMENT PANEL LAYOUT DETAIL AND EQUIPMENT SCHEDULE.

4. BACK & SIDE GEAR MOUNTING BRACKETS [6 OFF TOTAL] [25 X 25 X 3 (TYP.)].

5. THIS DRAWING TO BE READ IN CONJUNCTION WITH SHEET 06, FOLLOWING.

6. ANTENNA FLANGE MOUNTING DETAILS:- WHERE NO ANTENNA IS TO BE INSTALLED, PROVIDE Ø120 BLANKING PLATES WITH GASKETS, TO COVER SIDE AND REAR ANTENNA FLANGE DRILLING POSITIONS.

AS CONSTRUCTED DETAILS

I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: DATE:
NAME of SIGNATORY:
RPEQ No. or LICENCE:
COMPANY NAME:
START DATE: FINISH DATE:

SJ ELECTRIC QUEENSLAND

NAME SIGNATURE DATE
QUEENSLAND URBAN UTILITIES DELEGATE
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

QUEENSLAND UrbanUtilities

No	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO	APPROVED
1	03/12	DRAWING REVISED, ISSUED FOR CONSTRUCTION	A.C	A.C		
0	03/11	FOR CONSTRUCTION	A.P			

FUNDING
DESIGN W.O. No. .
CONSTRUCTION W.O. No. .
FUNDED BY Q.U.U. (✓) EXTERNAL ( )

DRAFTED	P.MOSTERT	12.07	
DRAFTING CHECK	P.HAGUE	12.07	
CAD FILE	49-0954-SetO.dwg		
Q.U.U. FILE No.	.		

Original Signed by A.WITTHOFT		12.07	
DESIGN	R.P.E.Q. No.	DATE	
Original Signed by R.JANFADA	REPQ5192	12.07	
DESIGN CHECK	R.P.E.Q. No.	DATE	

.		
APPROVED BY	SIGNATURE	DATE
.		
CONSTRUCTION MANAGER	SIGNATURE	DATE

ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
PRV SWITCHBOARD
GENERAL ARRANGEMENT

SHEET No. 1 OF 1
QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-005
AMEND. 1

CONSTRUCTION

Cubicle construction 3mm Marine grade Aluminium (5251).
Plinth construction 160x60 channel 6061 T6 Grade Aluminium.
Folded, "Pulse MIG" & "TIG welded with all visible seams and joints fully welded, free from splatter and ground smooth where needed.
External doors and covers fitted with Emka 1011-207 self grip seal.
"D" Handles fitted where indicated on the drawings.
M6 Earth studs fixed to the interior of all doors and hinged escutcheons and on adjacent cubicle interior surfaces.
Door stiffeners, door stays, cable straps, and document holders etc fitted where shown on the drawings.
Lift-off covers and mounting panels fixed with M8 studs & chrome acorn nuts.
Gland plates manufactured from 6mm Bakelite.
Gland plate openings reinforced with 25x6mm flat aluminium bar.
Gland plate seats attached to cubicle not gland plate.
Gland plate fixings are NOT more than 150 mm apart
Hinges Selectrix HI-B650.
Star washers fitted under all hinge screws.

Lock Door
Selectrix 1107 - PSCU1 handle
Selectrix 1107-U123 3pt cam
Lockwood 71 Barel Lock
Emka 1049-U3 roller rod
Lock Code RC496AB

PAINTING

Aluminium Surface Preparation.
Finish smooth all exposed welds, clean, descale, and degrease all surfaces.
Surfaces pretreatment in accordance with AS 1580 & AS 3715 using
Novox LF acid etch cleaner, Novacoat 12 conversion coating, & clean water rinses
Apply DULUX ALPHATECH 3000 powder coat to manufacturer's recommendations.
CUBICLE & EXTERNAL COMPONENTS :- DULUX Mist Green (36648) matt finish.
INTERIOR ITEMS (mounting panels, escutcheons, etc.) :- DULUX Bright White (32166)
Minimum Dry Film Thickness all surfaces 40 microns.

OPERATING PARAMETERS

Standard	AS 3439.1
Current & Frequency	AC 50Hz
Rated Operational Voltage Ue	240 VAC
Rated Insulation Voltage Ui	660 V
Rated Auxiliary Voltage	24 VDC / 240 VAC
Rated Current (Main Bus)	N/A
Short Circuit Current Isc	10 kA
Duration of Isc	1 sec
Degree of Protection	IP 55 to AS 1939
Measure of Protection by barriers and enclosures	
Service Conditions	Outdoors
Mass	Not exceeding 200kg
Forms of Segregation	Form 1
Earthing System	TN-S

WIRING

All wiring to be PVC V90 HT 0.6/1Kv Grade with tinned conductor.
Control and instrumentation wiring has flexible copper conductors, and is colour coded as detailed below, numbered each end, and terminated by the use of appropriate pre-insulated crimp lugs.
Power wiring to be minimum 2.5sqmm stranded copper conductors, phase colour coded as detailed below.
Low level instrumentation signals & 4-20mA signals wired in shielded pair minimum size 0.5sqmm. Earthed at one end only.
Earth cables minimum 2.5sqmm flexible.
Doors and hinged escutcheons bonded with 4sqmm flexible earth strap.
Wire numbering will be equal to Grafoplast SI2000 system.
Wire numbers are readable left to right,bottom to top as shown.

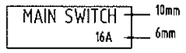
COLOUR CODE

Phase wiring (A,B &C)	Red, White, Blue	2.5sqmm (min)
Potential Metering (240/415 VAC)	Red, White, Blue, Black	1.5sqmm
Current Metering (Secondary)	Red, White, Blue, Grey	2.5sqmm
240 VAC Control Active	Red	1.5sqmm
240 VAC Neutral	Black	1.5sqmm
24 V ELV Positive	Orange	1.5sqmm
24 V ELV Negative	Violet	1.5sqmm
24 V RTU Positive	Orange	0.5sqmm
24 V RTU Negative	Violet	0.5sqmm
RTU Wiring	Grey	0.5sqmm
Intrinsically safe wiring	Blue	1.5sqmm
Earth	Green/Yellow	2.5sqmm (min)
Door & Escutcheon Earth Bonds	Green/Yellow	4 sqmm

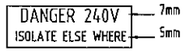
LABELS

Internal labels W/B/W engraved traffolyte to label schedule.
Warning labels R/W/R engraved traffolyte .

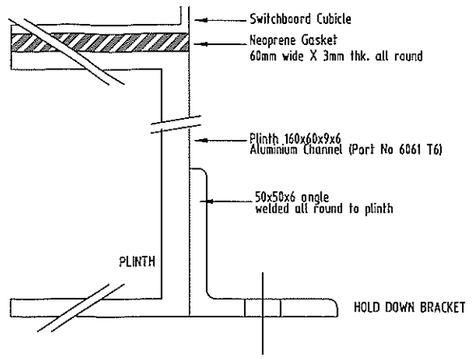
Main switch labels — Material B/W/B

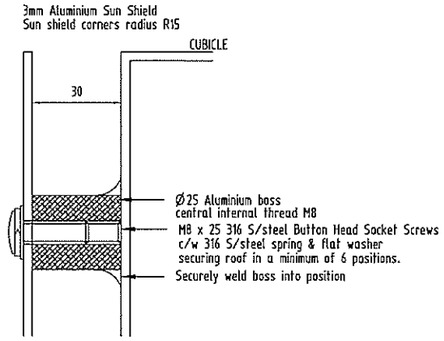


Warning labels — Material R/W/R

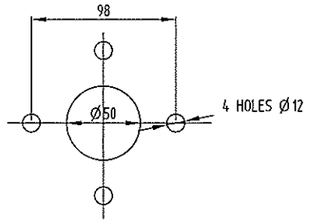


Internal labels secured by M3 chrome plated metal threads.
Labels obstructed by switchboard wiring are relocated to adjacent duct lid.
The duct lid is secured by a single cable tie at one corner.
External labels secured by M3 316 stainless steel metal threads.

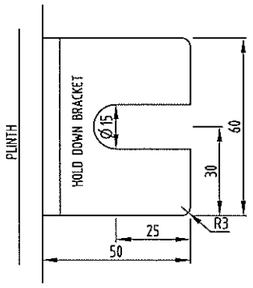




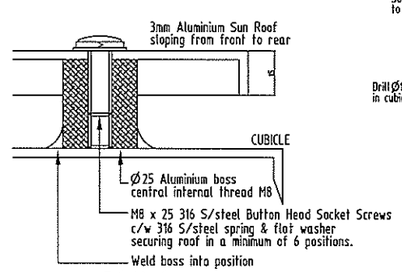
DETAIL B
(SUN SHIELD MOUNTING TO SIDES, REAR AND DOORS)



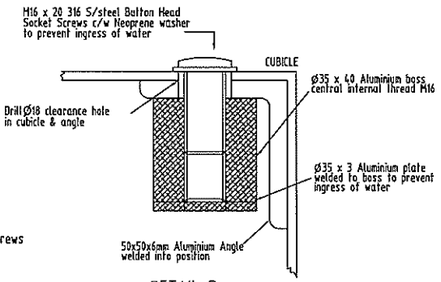
DETAIL P
(FIT 3mm NEOPRENE GASKET BETWEEN PLINTH & FLANGE)
(FIXINGS 316 S/STEEL BOLTS, NUTS, FLAT & SPRING WASHERS)
(AERIAL FLANGE MOUNTING DETAIL)



DETAIL E
(BOLTING DOWN FACILITIES DETAIL)

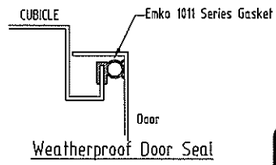


DETAIL C
(SUN ROOF FIXING DETAIL)

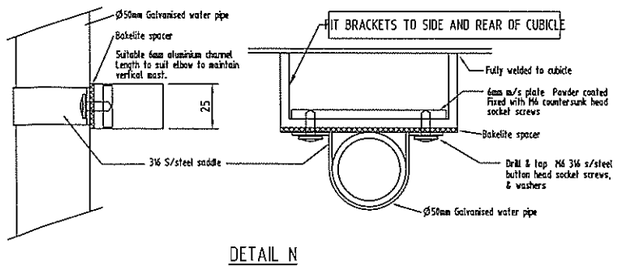


DETAIL D
(EYE BOLT FIXING DETAIL)

SET UP CUBICLE TO BE LEVEL & PLUMB BEFORE BOLTING TO CONCRETE PLINTH USING M12 BOLTS



Weatherproof Door Seal



DETAIL N
(AERIAL SUPPORT BRACKET DETAIL)

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SJ ELECTRIC QUEENSLAND

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Original Signed by R.JANFADA	RPEQ5192	12.07	
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.			
APPROVED BY	SIGNATURE	DATE	
.			
CONSTRUCTION MANAGER	SIGNATURE	DATE	

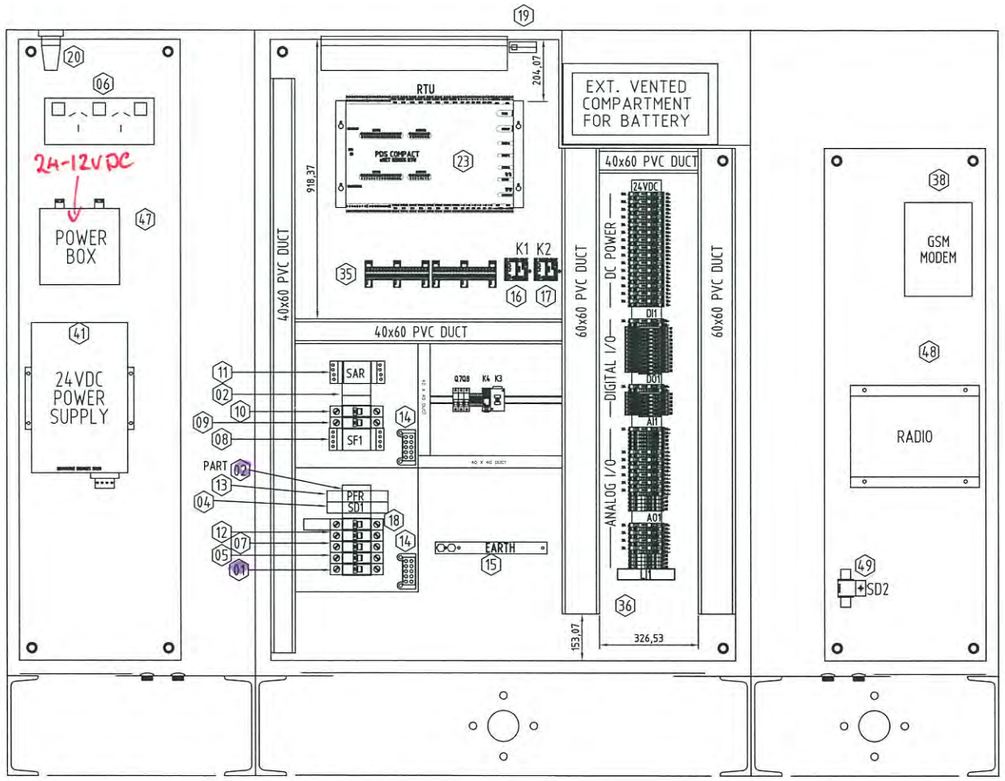
ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
SWITCHBOARDS
CONSTRUCTION DETAILS

SHEET No. 1 OF 1
QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-006
AMEND. 1

EQUIPMENT LIST

REF	QTY	DESCRIPTION	MANUFACTURER	CATALOGUE No	REMARKS
01	1	Q1 - MAIN CIRCUIT BREAKER	TERASAKI	DTCB10_16	10kA
02	5	POLE FILLER	TERASAKI	DT POLE FILLER	
03	2	IP30 8 POLE COVER	TERASAKI	DTPC8	
04	1	SD1 - SURGE DIVERTER	NHP	TITIAN DR1P45K230DC	45KA MAX
05	1	Q2 - GPO CIRCUIT BREAKER	TERASAKI	DTCB10_02	
06	1	GPO - COMPUTER OUTLET 30mA RCD	CLIPSAL	2A CB + RCD	
07	1	Q3 - SURGE FILTER CIRCUIT BREAKER	TERASAKI	DTCB10_06	
08	1	SF1 - SURGE FILTER	CRITEC	DSF-6A-275	
09	1	Q4 - PWR SUPPLY CIRCUIT BREAKER	TERASAKI	DTCB10_04	
10	1	Q5 - SURGE ALARM RLY CIRCUIT BREAKER	TERASAKI	DTCB10_02	
11	1	SAR- SURGE PROTN ALARM RLY	CRITEC	DAR-275V	
12	1	Q6 - POWER FAILURE RLY CIRCUIT BREAKER	TERASAKI	DTCB10_02	
13	1	PFR - POWER FAILURE RELAY	TERASAKI	DTC20-20-240	
14	2	NEUTRAL LINK	CLIPSAL	LA6	
15	1	EARTH LINK	CLIPSAL	BP165D18	
16	1	K1 - PRV PIT LEVEL RELAY	MULTITRODE	MTR-5	24VDC
17	1	K2 - LEVEL CONTROL RELAY	MULTITRODE	MTR-5	24VDC
18	1	Q7 - SUMP PUMP CIRCUIT BREAKER (30mA RCD)	TERASAKI	DSRCBH-06-30A	
19	2	SW/BD DOOR MICRO SWITCHES	CAMSCO	SM202	1 OFF N/O 1 OFF N/C
20					
21	1	CORROSION INHIBITOR	CORTEC	VPCI-110 OR 111	FROM AP CONTROLS
22	1	RTU	SERCK	eNET -5XEW-EI	eNET RTU WITH 1/2 I.O., 10-30V INPUT.
23	2	DISCONNECT PLUGS	PHOENIX CONTACT	MSTB 2,5/20-ST-5.08	
24	2	DISCONNECT BLOCKS	PHOENIX CONTACT	UMSTBVK2,5/20-G-5.08	
25	2	CABLE HOUSING	PHOENIX CONTACT	KGS-MSTB2.5/20	
26	1	CODING PINS	PHOENIX CONTACT	CP-MSTB + CR-MSTB	
27	Lot	FUSED TERMINALS with LED 24V INDICATION	PHOENIX CONTACT	UT4-HESI LED24 (5x20)	
28	Lot	FUSE CARTRIDGES	PHOENIX CONTACT	M205	RATINGS AS REQUIRED
29	Lot	DISCONNECT TERMINALS	PHOENIX CONTACT	UT4-MT P/P	
30	Lot	TERMINALS	PHOENIX CONTACT	UT4-?	
31	8	EARTH TERMINALS	PHOENIX CONTACT	UT4-MTD-PE/S	
32	6	GROUP MARKER CARRIER	PHOENIX CONTACT	UBE	
33	2	TEST PLUG ADAPTOR	PHOENIX CONTACT	PS-6	
34	1	SCREW DRIVER	PHOENIX CONTACT	SZS 0.6 x 3.5	
35	Lot	PLUG-IN BRIDGE	PHOENIX CONTACT	FBS	AS REQUIRED
36	1	LOOP ISOLATOR 4-20/4-20mA	WEIDMULLER	7940005521	(MAIN)
37	2	PRESSURE TRANSDUCER	E+H PMC131	IP68 4-20mA	FREE ISSUED - EXTERNAL TO SWBD ON SITE
38					
39	4				
40					
41	1	PS1 - RTU 24VDC POWER SUPPLY	POWERBOX	PB251-24CM-CC-T	
42					
43	1	SIGNAL CONVERTED 0-400mV TO 4-20mA/WEIDMULLER	7940016006	ITX SERIES	
44	1	PYRANOMETER	DECAGON DEVICE	PYR SOLAR RADIATION	ICT INTERNATIONAL
45					
46					
47	1	24V/12V DC CONVERTER	POWERBOX	PBIH-2412G	
48	1	RADIO	TRIO	ER450-53A02-EH0	
49	1	SD2 - RADIO COAX SURGE PROTECTOR	POLYPHASER CORPORATION	IS-50NX-C2	
50	1	ANTENNA MAST	SWBD MANUFACTURER		6 METRES
51	1	ANTENNA	POLAR INDUSTRIES	326 DIRECTIONAL YAGI	CENTRE FREQUENCY 483MHz
52	1	COAX CABLE (INTERNAL)	TRIO	NM/NM/TL23	N-TYPE MALE TO N-TYPE MALE RG233 FEEDER TAIL 500mm LONG
53	1	COAX CABLE (EXTERNAL)	R.F. INDUSTRIES	RG213	SUPPLIED LOOSE BY SWBD MFR & FITTED ON SITE
54					
55					
56	2	COAX CABLE PLUG	R.F. INDUSTRIES	N07 (MALE)	SUPPLIED LOOSE BY SWBD MFR & FITTED ON SITE
57	1	MAST CLAMPS	POLAR INDUSTRIES	P18	
58					
59	1	MAGNETIC FLOW METER TRANSMITTER	E+H PROMATIC 10	24VDC	FREE ISSUED TO SWBD MFR
60	1	ELECTRONIC ACTUATOR	SINGER	160-420DC	EXTERNAL TO SWITCHBOARD
61	1	240VAC SUMP PUMP	DANFOSS	KP150 50Hz 240VAC	EXTERNAL TO SWITCHBOARD
62					



LEFT SIDE EQUIPMENT PANEL | BACK EQUIPMENT PANEL | RIGHT SIDE EQUIPMENT PANEL

EQUIPMENT PANEL - LAYOUT DETAIL

SCALE: 1/5 ON A1 SIZE PRINT

NB:-
INDICATING LIGHTS ON THE 24V DC POWER SUPPLY AND THE RADIO MUST FACE UPWARDS.

NOTES:

1.0 LABELS FITTED ADJACENT ASSOCIATED EQUIPMENT

2.0 LABELS OBSTRUCTED BY SWITCHBOARD WIRING ARE RELOCATED TO ADJACENT DUCT LID. DUCT LIDS LOCATED BY SINGLE CABLE TIE AT ONE CORNER

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APPROVED BY	SIGNATURE	DATE
.		
CONSTRUCTION MANAGER	SIGNATURE	DATE

ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
PRV SWITCHBOARD
EQUIPMENT LIST

SHEET No. 1 OF 1

QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-007

AMEND. 1

CABLE SCHEDULE

CABLE No.	SIZE mm²	CORES	TYPE	LENGTH (metres)	FROM - TO - VIA ROUTE	CABLE FUNCTION	REMARKS
P01	4	2	PVC/PVC/CIRC	site specific	ENERGEX Pole to new RTU enclosure	Incoming Mains	Electrical Installation Contractor
P02	10		Building wire	1	Earth stake to RTU earth bar	Main earth	Electrical Installation Contractor
P03	2.5	2C+E	PVC/PVC/CIRC	site specific	SwBd Terminal strip to PRV pit 240VAC SUMP PUMP IP68 JBOX	SUMP PUMP	Electrical Installation Contractor
X01			Coax	1	New switchboard radio to aerial coax surge protector	Radio Communications	Switchboard Manufacturer
X02			Coax	7	Aerial coax surge protector to antenna	Radio Communications	Switchboard Manufacturer
X03		6	Special	2	Radio to RTU Port 1	Communications	Switchboard Manufacturer
X04							
C01	1.5	1 PAIR	DEKORON	site specific	RTU terminal strip to pressure transmitter	Pressure 1 Tx signal	Switchboard Manufacturer
C02	1.5	1 PAIR	DEKORON	site specific	RTU terminal strip to pressure transmitter	Pressure 2 Tx signal	Switchboard Manufacturer
C03	N/A	N/A	Special	site specific	Flowmeter Sensor to Flowmeter Transmitter	Flowmeter Sensor	FREE ISSUE
C03A	N/A	N/A	Special	site specific	Flowmeter Sensor to Flowmeter Transmitter	Flowmeter Sensor	FREE ISSUE
C04	1.5	4 PAIR	DEKORON	site specific	RTU enclosure to Electronic Actuator (Main) in valve pit	Valve Control	Electrical Installation Contractor
C05							
C06	1.5	2	PVC/PVC/CIRC	site specific	SwBd Terminal strip to PRV pit HI LEVEL PROBE	WATER IN PIT HI LEVEL	Electrical Installation Contractor
C07	1.5	2	PVC/PVC/CIRC	site specific	SwBd Terminal strip to PRV pit VALVE POSITION LIMIT SWITCH	RTU PILOT VALVE ACTIVE	Electrical Installation Contractor

EQUIPMENT LABEL LIST

REF	TEXT HEIGHT mm / MATERIAL	TEXT LINE 1 / TEXT LINE 2
45	4mm / WBW TRAFFOLYTE	- INLET ZONE PRESSURE
45	4mm / WBW TRAFFOLYTE	- OUTLET ZONE PRESSURE
48	4mm / WBW TRAFFOLYTE	- FLOWMETER
49	4mm / WBW TRAFFOLYTE	SD2 - RADIO SURGE DIVERTER

EQUIPMENT LABEL LIST

REF	TEXT HEIGHT mm / MATERIAL	TEXT LINE 1 / TEXT LINE 2
01	10mm / 4mm / WBW TRAFFOLYTE	MAIN SWITCH / Q1 - 16A
04	4mm / WBW TRAFFOLYTE	SD1 - SURGE DIVERTER
05	4mm / WBW TRAFFOLYTE	Q2 - LAPTOP GPO - 2A
06	4mm / WBW TRAFFOLYTE	2Amp LAPTOP ONLY
07	4mm / WBW TRAFFOLYTE	Q3 - SURGE FILTER - 6A
08	4mm / WBW TRAFFOLYTE	SF1 - SURGE FILTER
09	4mm / WBW TRAFFOLYTE	Q4 - 24V PWR SUPPLY - 4A
10	4mm / WBW TRAFFOLYTE	Q5 - SURGE ALM RLY - 2A
11	4mm / WBW TRAFFOLYTE	SAR - SURGE ALM RLY
12	4mm / WBW TRAFFOLYTE	Q6 - POWER FAIL RLY - 2A
13	4mm / WBW TRAFFOLYTE	PFR - POWER FAIL RLY
14	4mm / WBW TRAFFOLYTE	NEUTRAL
15	4mm / WBW TRAFFOLYTE	EARTH
18		
19	4mm / WBW TRAFFOLYTE	PS1 - 24VDC10A PWR SUPPLY
20	4mm / WBW TRAFFOLYTE	24/13.8VDC CONVERTER
21	4mm / WBW TRAFFOLYTE	BATTERY COMPARTMENT
22	4mm / WBW TRAFFOLYTE	RTU
24	4mm / WBW TRAFFOLYTE	K1 - PRV PIT LEVEL RLY
25		
28		
29		
45		

EXTERNAL LABELS

LABEL	TEXT	TEXT HEIGHT	PAINT FILL LETTERING	DIMENSIONS	QTY
A	PRV154	20mm	BLACK	150X35	1
B	WARNING THIS SITE IS MONITORED BY THE CONTROL ROOM OPERATOR PLEASE INFORM THE OPERATOR BEFORE ISOLATING STATION	8mm	BLACK	250X100	1
C	DANGER 240V	8mm	RED	120X15	1
D	REMINDER: THIS IS AN UN-METERED SUPPLY AND ANY ALTERATIONS TO THESE CIRCUITS MUST BE NOTIFIED TO SUPPLY AUTHORITY BILLING DEPARTMENT.	3mm	BLACK	TO SUIT	1
A	PRV154A	20mm	BLACK	150X35	1

EXTERNAL LABELS 1mm THK. 316 GRADE STAINLESS STEEL.
FIXED WITH M3 316 STAINLESS STEEL METAL THREADS.

AS CONSTRUCTED DETAILS

I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: DATE:

NAME of SIGNATORY:

RPEQ No. or LICENCE:

COMPANY NAME:

START DATE: FINISH DATE:

SJ ELECTRIC QUEENSLAND

NAME SIGNATURE DATE

QUEENSLAND URBAN UTILITIES DELEGATE
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

QUEENSLAND UrbanUtilities

No	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO	APPROVED
1	03/12	DRAWING REVISED. ISSUED FOR CONSTRUCTION	A.C	A.C		
0	03/11	FOR CONSTRUCTION	A.P			

FUNDING
DESIGN W.O. No. .
CONSTRUCTION W.O. No .
FUNDED BY Q.U.U. (✓) EXTERNAL ( )

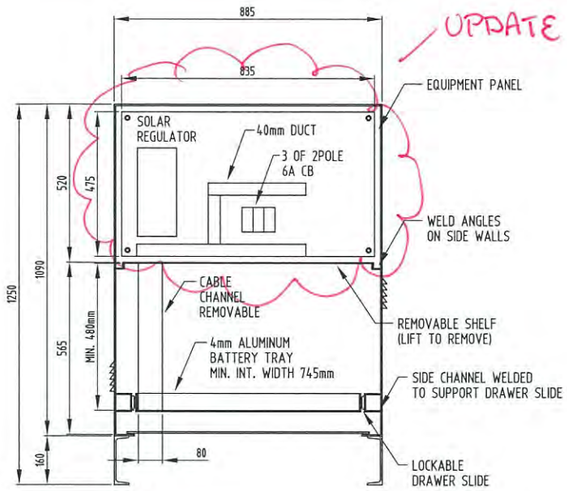
DRAFTED	P.MOSTERT	12.07	Original Signed by A.WITTHOFT . 12.07
DRAFTING CHECK	P.HAGUE	12.07	DESIGN R.P.E.Q. No. DATE
CAD FILE	49-0954-SetQ.dwg		Original Signed by R.JANFADA RPEQ5192 12.07
Q.U.U. FILE No.			DESIGN CHECK R.P.E.Q. No. DATE

. APPROVED BY SIGNATURE DATE
. CONSTRUCTION MANAGER SIGNATURE DATE

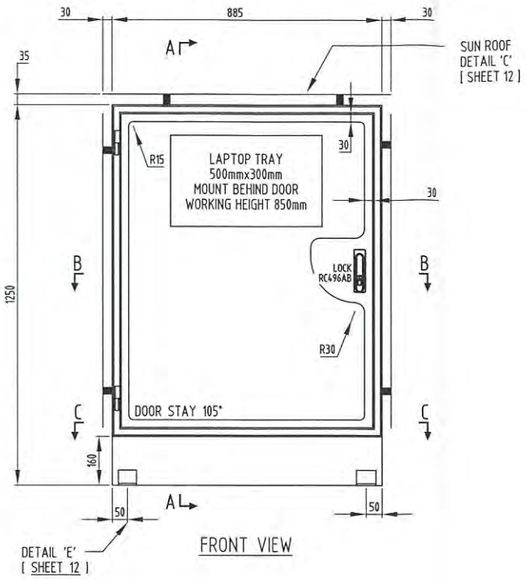
ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
SWITCHBOARD
CABLE & LABEL SCHEDULE

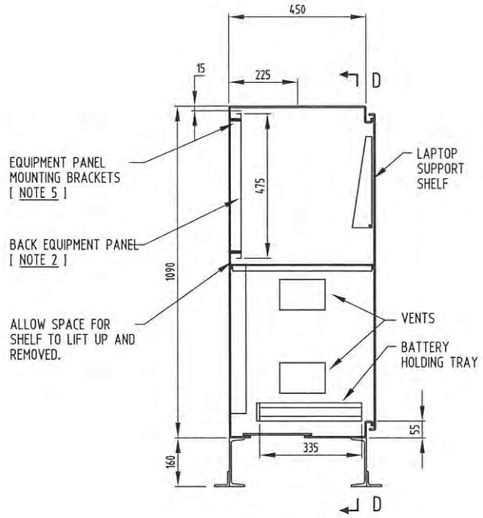
SHEET No. 1 OF 1
QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-008
AMEND. 1



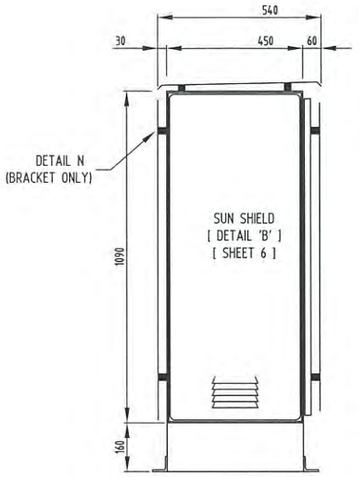
SECTION D-D
[REFER DRG SHT 07]



FRONT VIEW



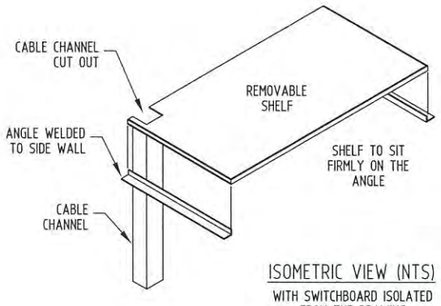
SECTION A-A



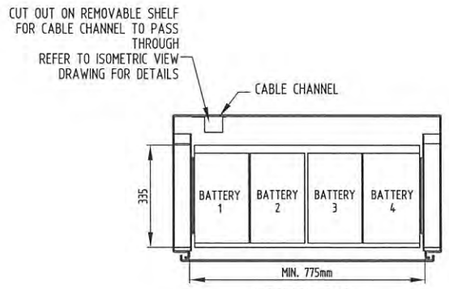
LEFT VIEW

GENERAL ARRANGEMENT

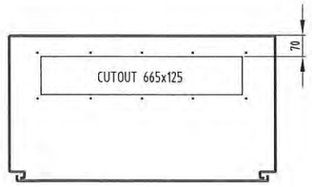
SCALE: 1/10 ON A1 SIZE PRINT



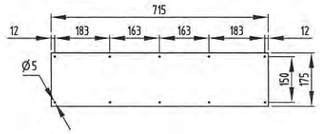
ISOMETRIC VIEW (NTS)
WITH SWITCHBOARD ISOLATED FROM THE DRAWING



SECTION B-B
WITH BATTERY INSIDE SWITCHBOARD



SECTION C-C
FLOOR CUTOUTS
FOR CABLE ENTRY & INSPECTION ACCESS



INSPECTION PLATE
3mm AL + GASKET + M4 SCREWS

NOTES:

1. REFER TO SHEET 06 FOR THE SWITCHBOARD CONSTRUCTION DETAILS.

2. BACK EQUIPMENT PANEL TO BE MOUNTED 40mm OFF THE BACK WALL AND OPEN AT BOTH THE TOP AND BOTTOM TO ALLOW FOR AIR FLOW.

3. REFER TO SHEET FOR THE EQUIPMENT PANEL LAYOUT DETAIL AND EQUIPMENT SCHEDULE.

4. BACK GEAR MOUNTING BRACKETS [6 OFF TOTAL] [25 X 25 X 3 (TYP.)].

5. THIS DRAWING TO BE READ IN CONJUNCTION WITH SHEET 06.

6. BATTERY TRAY TO HAVE MINIMUM INTERNAL WIDE OF 745mm TO FIT IN 4xBATTERIES.

CONSTRUCTION

Cubicle construction 3mm Marine grade Aluminium (5251).
Plinth construction 160x60 channel 6061 T6 Grade Aluminium.
Folded, "Pulse MIG" & "TIG welded with all visible seams and joints fully welded, free from splatter and ground smooth where needed.
External doors and covers fitted with Emka 1011-207 self grip seal.
"D" Handles fitted where indicated on the drawings.
M6 Earth studs fixed to the interior of all doors and hinged escutcheons and on adjacent cubicle interior surfaces.
Door stiffeners, door stays, cable straps, and document holders etc fitted where shown on the drawings.
Lift-off covers and mounting panels fixed with M8 studs & chrome acorn nuts.
Gland plates manufactured from 6mm Bakelite.
Gland plate openings reinforced with 25x6mm flat aluminium bar.
Gland plate seals attached to cubicle not gland plate.
Gland plate fixings are NOT more than 150 mm apart
Hinges Selectrix HI-B650.
Star washers fitted under all hinge screws.

Lock Door

Selectrix 1107 - PSCU1 handle
Selectrix 1107-U123 3pt cam
Lockwood 71 Barel Lock
Emka 1049-U3 roller rod
Lock Code RC496AB

PAINTING

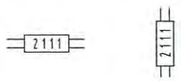
Aluminium Surface Preparation.
Finish smooth all exposed welds, clean, descale, and degrease all surfaces.
Surfaces pretreatment in accordance with AS 1580 & AS 3715 using
Novox LF acid etch cleaner, Novacoat 12 conversion coating, & clean water rinses
Apply DULUX ALPHATECH 3000 powder coat to manufacturer's recommendations.
CUBICLE & EXTERNAL COMPONENTS :- DULUX Mist Green (36648) matt finish.
INTERIOR ITEMS (mounting panels, escutcheons, etc.) :- DULUX Bright White (32166)
Minimum Dry Film Thickness all surfaces 40 microns.

OPERATING PARAMETERS

Standard	AS 3439.1
Current & Frequency	AC 50Hz
Rated Operational Voltage Ue	240 VAC
Rated Insulation Voltage Ui	660 V
Rated Auxiliary Voltage	24 VDC / 240 VAC
Rated Current (Main Bus)	N/A
Short Circuit Current Isc	10 kA
Duration of Isc	1 sec
Degree of Protection	IP 55 to AS 1939
Measure of Protection by barriers and enclosures	
Service Conditions	Outdoors
Mass	Not exceeding 200kg
Forms of Segregation	Form 1
Earthing System	TN-S

WIRING

All wiring to be PVC V90 HT 0.6/1Kv Grade with tinned conductor.
Control and instrumentation wiring has flexible copper conductors, and is colour coded as detailed below, numbered each end, and terminated by the use of appropriate pre-insulated crimp lugs.
Power wiring to be minimum 2.5sqmm stranded copper conductors, phase colour coded as detailed below.
Low level instrumentation signals & 4-20mA signals wired in shielded pair minimum size 0.5sqmm. Earthed at one end only.
Earth cables minimum 2.5sqmm flexible.
Doors and hinged escutcheons bonded with 4sqmm flexible earth strap.
Wire numbering will be equal to Grafoplast SI2000 system.
Wire numbers are readable left to right,bottom to top as shown.



COLOUR CODE

Phase wiring (A,B &C)	Red, White, Blue	2.5sqmm (min)
Potential Metering (240/415 VAC)	Red, White, Blue, Black	1.5sqmm
Current Metering (Secondary)	Red, White, Blue, Grey	2.5sqmm
240 VAC Control Active	Red	1.5sqmm
240 VAC Neutral	Black	1.5sqmm
24 V ELV Positive	Orange	1.5sqmm
24 V ELV Negative	Violet	1.5sqmm
24 V RTU Positive	Orange	0.5sqmm
24 V RTU Negative	Violet	0.5sqmm
RTU Wiring	Grey	0.5sqmm
Intrinsically safe wiring	Blue	1.5sqmm
Earth	Green/Yellow	2.5sqmm (min)
Door & Escutcheon Earth Bonds	Green/Yellow	4 sqmm

AS CONSTRUCTED DETAILS

I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: DATE:
NAME of SIGNATORY:
RPEQ No. or LICENCE:
COMPANY NAME:
START DATE: FINISH DATE:

SJ ELECTRIC QUEENSLAND

NAME SIGNATURE DATE
QUEENSLAND URBAN UTILITIES DELEGATE
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

QUEENSLAND UrbanUtilities

No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED
0	05.03.12	DRAWING REVISED, ISSUED FOR CONSTRUCTION	A.C	A.C		

FUNDING
DESIGN W.O. No.
CONSTRUCTION W.O. No.
FUNDED BY Q.U.U. (✓) EXTERNAL ( )

DRAFTED	P.MOSTERT	12.07	
DRAFTING CHECK	P.HAGUE	12.07	
CAD FILE	49-0954-SetO.dwg		
Q.U.U. FILE No.			

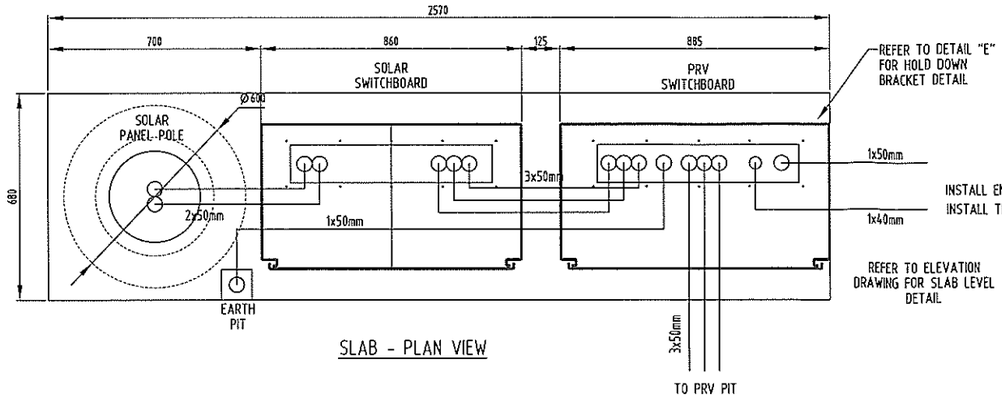
Original Signed by A. WITTHOFT			12.07
DESIGN	R.P.E.Q. No.	DATE	
Original Signed by R.JANFADA	RPEQ5192		12.07
DESIGN CHECK	R.P.E.Q. No.	DATE	

APPROVED BY	SIGNATURE	DATE
CONSTRUCTION MANAGER	SIGNATURE	DATE

ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
SOLAR PANEL SWITCHBOARD GENERAL ARRANGEMENT

SHEET No. 1 OF 1
QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-009
AMEND. 0



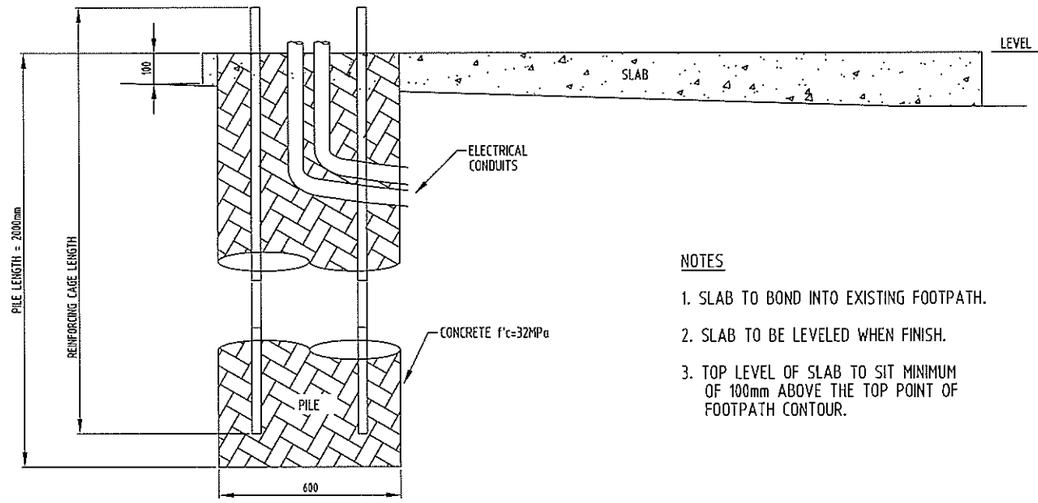
SLAB - PLAN VIEW

INSTALL ENERGEX CONDUIT FOR FUTURE BLANKED OFF 300mm FROM EDGE OF PLYNTH
INSTALL TELSTRA CONDUIT FOR FUTURE BLANKED OFF 300mm FROM EDGE OF PLYNTH

CONDUIT SCHEOULE:

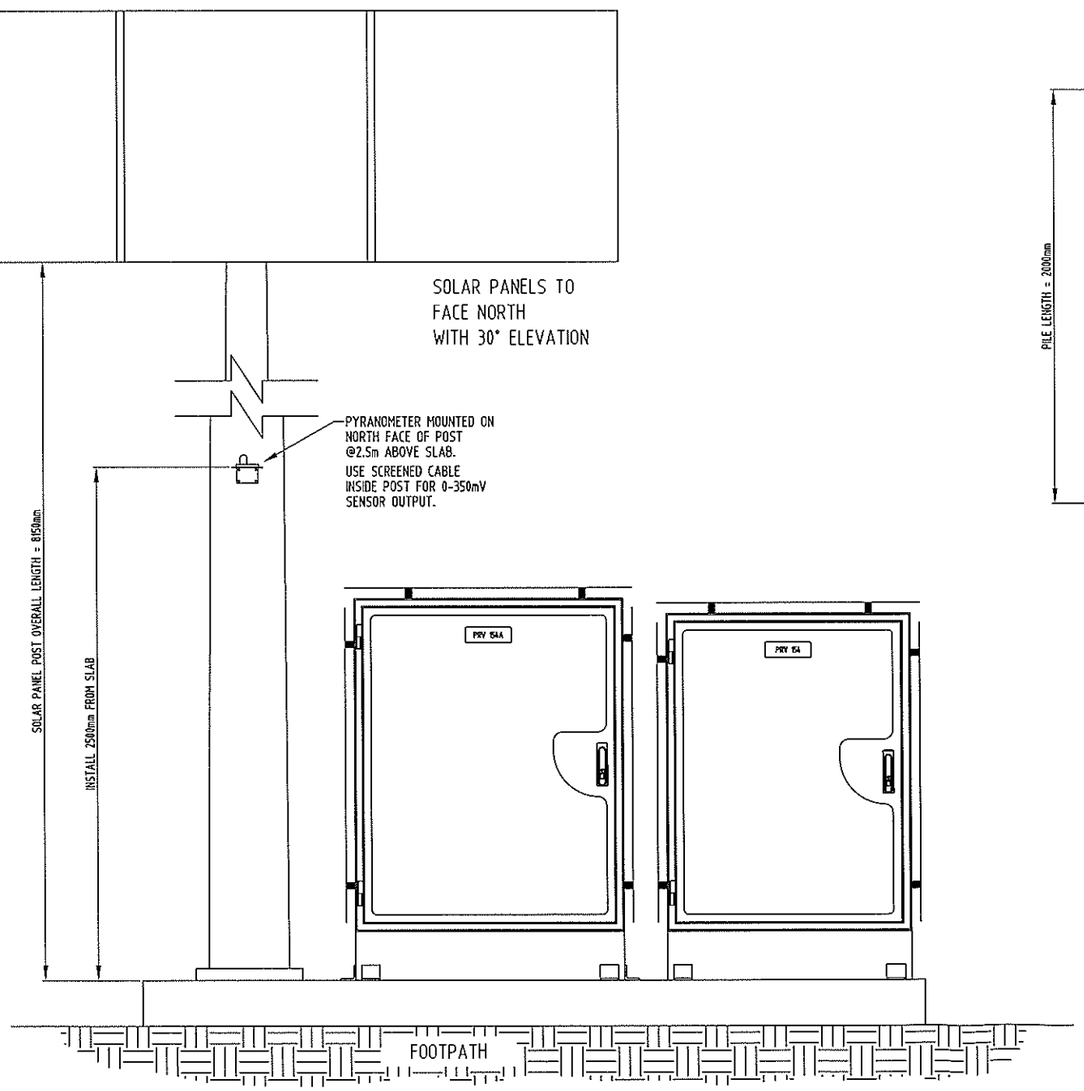
QTY	CONDUIT SIZE	FROM	TO
2	50mm	SOLAR POLE	SOLAR SWB
3	50mm	SOLAR SWB	PRV SWB
1	50mm	PRV SWB	EARTH PIT
3	50mm	PRV SWB	PRV PIT
1	50mm	PRV SWB	OUTSIDE SLAB FOR ENERGEX
1	40mm	PRV SWB	OUTSIDE SLAB FOR PHONE

SLAB - ELEVATION



NOTES

1. SLAB TO BOND INTO EXISTING FOOTPATH.
2. SLAB TO BE LEVELED WHEN FINISH.
3. TOP LEVEL OF SLAB TO SIT MINIMUM OF 100mm ABOVE THE TOP POINT OF FOOTPATH CONTOUR.



OVERALL LAYOUT - ELEVATION

AS CONSTRUCTED DETAILS

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SJ ELECTRIC QUEENSLAND

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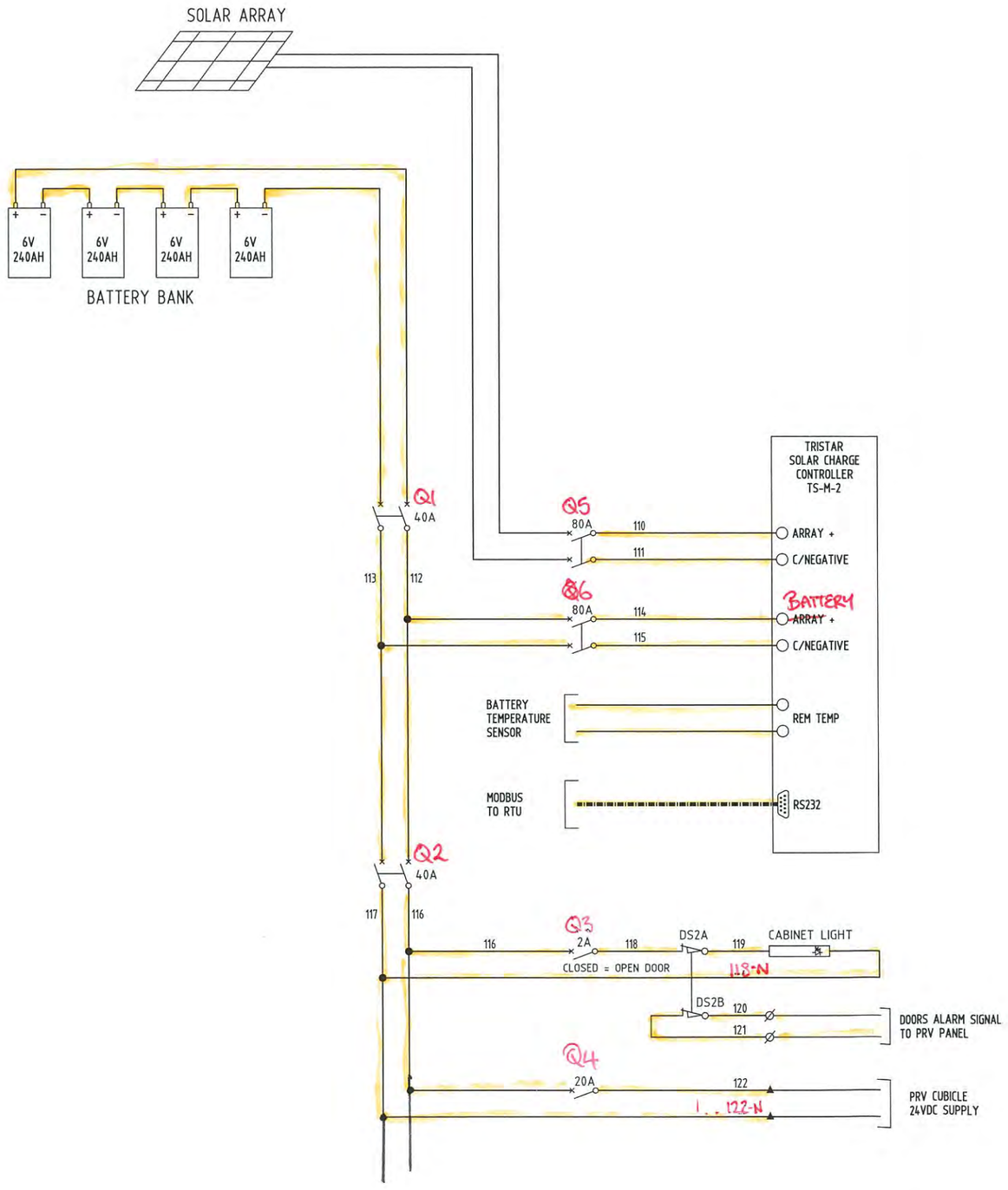
FUNDING		DRAFTED	P.MOSTERT	12.07	Original Signed by A.WITTHOFT	.	12.07	.		
DESIGN W.O. No.	.	DRAFTING CHECK	P.HAGUE	12.07	DESIGN	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE	DATE
CONSTRUCTION W.O. No.	.	CAD FILE	49-0954-SetO.dwg		Original Signed by R. JANFADA	RPEQ5192	12.07	.		
FUNDED BY Q.U.U. (✓) EXTERNAL ( )		Q.U.U. FILE No.	.		DESIGN CHECK	R.P.E.Q. No.	DATE	CONSTRUCTION MANAGER	SIGNATURE	DATE

ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
SITE OVERALL LAYOUT

SHEET No. 1 OF 1
QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-010
AMEND. 0

PT TO PT & FUNCTION
8/3/12 113407
GLENN BACON
Glenn Bacon



LEGEND:

- ▲ SWITCHBOARD POWER TERMINAL
- ⌀ SWITCHBOARD CONTROL TERMINAL
- ⊠ FIELD DEVICE TERMINAL
- ⊠ FIELD MARSH. PANEL TERMINAL
- ◧ PLC TERMINAL
- ◪ RTU TERMINAL
- ■ VFD TERMINAL
- ● PLC/RTU MARSH. FUSE TERMINAL
- ○ PLC/RTU MARSH. LINK TERMINAL
- DI1-02 RTU DIGITAL INPUT
- DO1-02 RTU DIGITAL OUTPUT
- AI1-02 RTU ANALOGUE INPUT
- AO1-02 RTU ANALOGUE OUTPUT

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START DATE: FINISH DATE:

SJ ELECTRIC QUEENSLAND

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(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

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CONSTRUCTION W.O. No. .
FUNDED BY Q.U.U. (✓) EXTERNAL ( )

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DRAFTING CHECK	P.HAGUE	12.07
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Original Signed by A.WITTHOFT	.		12.07
DESIGN	R.P.E.Q. No.		DATE
Original Signed by R.JANFADA	RPEQ5192		12.07
DESIGN CHECK	R.P.E.Q. No.		DATE

.		
APPROVED BY	SIGNATURE	DATE
.		
CONSTRUCTION MANAGER	SIGNATURE	DATE

ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE .
HALE STREET
SOLAR PANEL
SWITCHBOARD

SHEET No. 1 OF 1
QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-011
AMEND. 0

3. Drawings

3.3. As Built Drawings

QUEENSLAND UrbanUtilities

PRV154, PRV154A
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE SWITCHBOARD

	VARIABLE / LAYER	VALUE / ON or OFF				
DRAWING VARIABLE	PRV No. (01)	PRV154, PRV154A				
	StreetName (02)	CORDELIA ST				
	SuburbName (03)	SOUTH BRISBANE				
	Pin Gauge No. (04)	-				
	Pout Gauge No. (05)	-				
	Flowmeter No. (06)	-				
	RadioPartNo. (07)	ER450-53A02-EH0				
	DrawingNo. (08)	486/4/9-0954-				
	Site Function (09)	PRESSURE REGULATING VALVE				
	SPARE (10)	----				
DRAWING LAYER	1.1 Main PRV fitted	yes	Yes	No	No	
	1.2.1 Bypass PRV fitted	no	No	No	No	
	2.1 Radio fitted	yes	Yes	No	No	
	2.1.1 Side Antenna Mast fitted	yes	Yes	No	No	
	2.1.2 Rear Antenna Mast fitted	no	No	No	No	
	3.1 PSTN Modem fitted	no	No	No	No	
	3.2 GSM Modem fitted	no	Yes	Yes	Yes	
	4.1 Flowmeter fitted	yes	Yes	No	Yes	
	5.1.1 Pressure Guage 1 fitted	yes	Yes	Yes	Yes	
	5.2.1 Pressure Guage 2 fitted	yes	Yes	No	Yes	
	6.1 Sump Pump fitted	yes	Yes	No	No	
	7.1 RTU - MD331 fitted	no	No	No	No	
	7.2 RTU - eNet fitted	yes	Yes	Yes	Yes	
	7.3 RTU plg/skt fitted	yes	Yes	Yes	Yes	

PRESSURE REGULATING VALVE
PRESSURE GAUGE
FLOWMETER

ELECTRICAL DRAWINGS INDEX

DWG N°.	TITLE	SHEET	REVISIONS				
486/4/9-0954-001	ELECTRICAL DRAWING INDEX	01	0	1	2		
486/4/9-0954-002	POWER DISTRIBUTION SCHEMATIC DIAGRAM	02	0	1	2		
486/4/9-0954-003	DIGITAL INPUTS AND OUTPUTS TERMINATION DIAGRAM	03	0	1	2		
486/4/9-0954-004	ANALOG INPUTS AND OUTPUTS TERMINATION DIAGRAM	04	0	1	2		
486/4/9-0954-005	PRV SWITCHBOARD GENERAL ARRANGEMENT	05	0	1	2		
486/4/9-0954-006	SWITCHBOARDS CONSTRUCTION DETAILS	06	0	1	2		
486/4/9-0954-007	PRV SWITCHBOARD EQUIPMENT LIST	07	0	1	2		
486/4/9-0954-008	SWITCHBOARD CABLE & LABEL SCHEDULE	08	0	1	2		
486/4/9-0954-009	SOLAR PANEL SWITCHBOARD GENERAL ARRANGEMENT	09	A	0	1		
486/4/9-0954-010	SITE OVERALL LAYOUT	010	A	0	1		
486/4/9-0954-011	HALE STREET SOLAR PANEL SWITCHBOARD	011	A	0	1		

NOTE:
EXISTING SWITCHBOARD TO BE INSTALLED

AS CONSTRUCTED DETAILS

I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: DATE: 11/5/12

NAME of SIGNATORY: DAMIAN WHITE

RPEQ No. or LICENCE: C20186

COMPANY NAME: SJ ELECTRIC

START DATE: JUNE, 2011 FINISH DATE: APRIL, 2012

SJ ELECTRIC QUEENSLAND

NAME SIGNATURE DATE

QUEENSLAND URBAN UTILITIES DELEGATE
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

QUEENSLAND UrbanUtilities

No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED
2	05/12	AS CONSTRUCTED	A.C	A.C		D.W
1	03/12	DRAWING REVISED, ISSUED FOR CONSTRUCTION	A.C	A.C		D.W
0	03/11	FOR CONSTRUCTION	A.C			

FUNDING
DESIGN W.O. No.
CONSTRUCTION W.O. No.
FUNDED BY Q.U.U. (✓) EXTERNAL ( )

DRAFTED	A.CHEN	03.11	Original Signed by A.CHEN 03.12
DRAFTING CHECK	D.WHITE	03.11	DESIGN R.P.E.Q. No. 0
CAD FILE	49-0954-SetO.dwg		Original Signed by D.WHITE RPEQ 03.12
Q.U.U. FILE No.			DESIGN CHECK R.P.E.Q. No. DATE

APPROVED BY SIGNATURE DATE
CONSTRUCTION MANAGER SIGNATURE DATE

ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
ELECTRICAL DRAWING INDEX

SHEET No. 1 OF 11

QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-001

AMEND. 2

ENERGEX UNMETERED SUPPLY
240VAC 10kA MAX
N L

EARTH STAKE
MEN LINK
EARTH
NEUTRAL
IP30 COVER
Q1 16A
LABEL "MAIN SWITCH"
101

2A Q2
102
102N
102E
LAPTOP OUTLET 30mA RCD

OUTLET LABEL:-
LAPTOP ONLY - 2A

SURGE FILTER
6A 275VAC
CRITEC DINLINE DSF-6A-275
SF1
L1 N E L2 N2
6A Q3
103
103N
103E
IP30 COVER
103A
4A Q4
104
SN1
104E

SURGE DIVERTER
230V 45kA
TITAN DR1P45K230DC
SD1
L E COM NC
CLOSED=HEALTHY

SURGE PROTN ALARM RLY
240VAC
CRITEC SAR-275V
2A Q5
105
SN1
SPR1
SPR3
SAR COM NO
RTU "SURGE PROTECTION OK" INPUT
REFER SHEET 03:E6
CLOSED=HEALTHY

POWER FAIL RELAY
240VAC
FINDER 38.51240VAC
2A Q6
106
106N
PFR COM NO
RTU "MAINS POWER OK" INPUT
REFER SHEET 03:E6
CLOSED=HEALTHY
6A Q7

RTU POWER SUPPLY
10A 24VDC
POWER BOX PB251-24CM
PS1
LOAD
BATT
BOK COM NC
RTU "BATTERY OK" INPUT
REFER SHEET 03:D6
0=FAULT, 1=HEALTHY
RTU COM NC
RTU "RTU POWER OK" INPUT
REFER SHEET 03:D6
0=FAULT, 1=HEALTHY
L N E

24VDC SUPPLY
FROM SOLAR CUBICLE
10AMP J2A+ J2A-

SAMP J3+ J3-
24V DC / 13.8V DC
J4A+ J4A-
SAMP J4+ J4-
RADIO B A
X01
SD2
X02
X03
Rx TBA
Tx TBA

SAMP J5+ J5-
2-17
2-18
J5+ J5-
J13+ J13-

SAMP J6+ J6-
RTU 24VDC CARD SUPPLY

SAMP J7+ J7-
PIT FLOODED LEVEL RELAY K1

SAMP J8+ J8-
LEVEL CONTROL RELAY K2

SAMP J9+ J9-
MAIN ACTUATOR

SAMP J10+ J10-
FLOWMETER

SAMP 11+ 11-
SPARE RESERVED FOR BYPASS ACTUATOR

SAMP 12+ 12-
SPARE RESERVED FOR GSM MODEM

SAMP J14+ J14-
CABINET LIGHT

SAMP J15+ J15-
MTR K2
107
PUMP INHIBIT K4
108
PUMP RUN K3
K3
109
SUMP PUMP

REFER SHEET 03

NOT USED

PDS COMPACT
eNET SERIES RTU
DC IN
DC OUT
PORT 0
PORT 1
PORT 2
RADIO
LAN/LINK
ETHERNET
INPUTS
OUTPUTS
DIAGNOSTICS
H2A

REFER SHEET 04
REFER SHEET 04
REFER SHEET 03
REFER SHEET 03

REF: H8
DS1A
J14+
106A
CABINET LIGHT
J14-
CLOSED = OPEN DOOR

LEGEND:
- SWITCHBOARD POWER TERMINAL
- SWITCHBOARD CONTROL TERMINAL
- FIELD DEVICE TERMINAL
- FIELD MARSH. PANEL TERMINAL
- PLC TERMINAL
- RTU TERMINAL
- VFD TERMINAL
- PLC/RTU MARSH. FUSE TERMINAL
- PLC/RTU MARSH. LINK TERMINAL
- DI1-02 RTU DIGITAL INPUT
- DO1-02 RTU DIGITAL OUTPUT
- AI1-02 RTU ANALOGUE INPUT
- AO1-02 RTU ANALOGUE OUTPUT

NOTES
1. CIRCUIT BREAKERS SHALL BE SHROUDED.
2. FAULT LEVEL OF 10kA AT 240V FOR 0.2sec.
3. ALL FUSES ARE 500mA EXCEPT WHERE NOTED OTHERWISE.
4. INSTRUMENT EARTH SHALL BE SEPARATED FROM PROTECTIVE EARTH.

CABLE X03 TERMINATION DIAGRAM
eNet RTU -------- TRIO RADIO

White	RJ11-1	DB9-M-1
Black	RJ11-2	DB9-M-2
Red	RJ11-3	DB9-M-3
Green	RJ11-4	DB9-M-4
Yellow	RJ11-5	DB9-M-5
Blue	RJ11-6	DB9-M-6
		DB9-M-7
		DB9-M-8
		DB9-M-9

AS CONSTRUCTED DETAILS
I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.
SIGNED: DATE 11/5/12
NAME of SIGNATORY: DAMIAN WHITE
RPEQ No. or LICENCE: C20186
COMPANY NAME: SJ ELECTRIC
START DATE: JUNE, 2011 FINISH DATE: APRIL, 2012

SJ ELECTRIC QUEENSLAND

NAME SIGNATURE DATE
QUEENSLAND URBAN UTILITIES DELEGATE
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)
QUEENSLAND UrbanUtilities

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0	03/11	FOR CONSTRUCTION	A.C			

FUNDING
DESIGN W.O. No.
CONSTRUCTION W.O. No.
FUNDED BY Q.U.U. (✓) EXTERNAL ( )

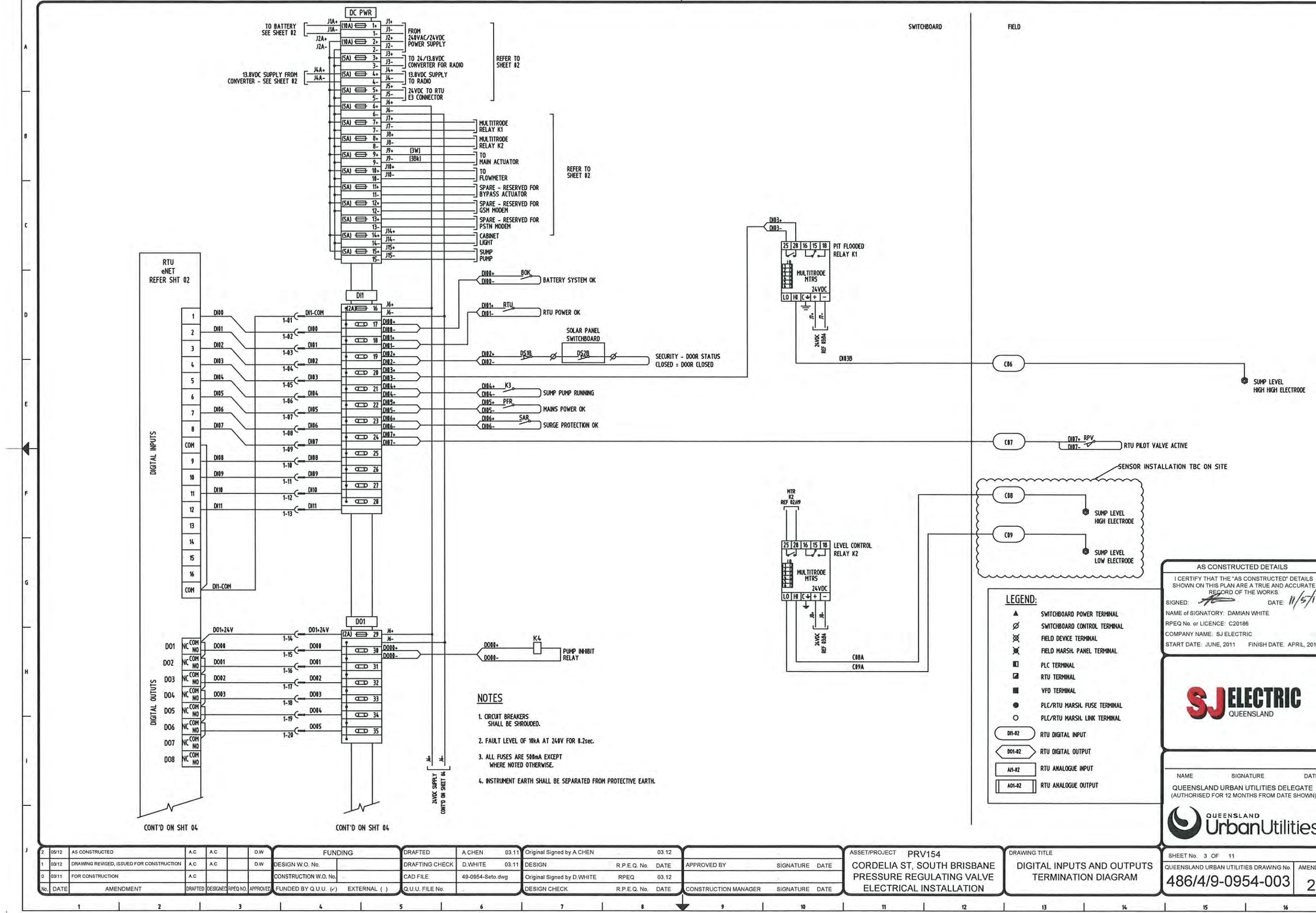
DRAFTED	A.CHEN	03.11	Original Signed by A.CHEN 03.12
DRAFTING CHECK	D.WHITE	03.11	DESIGN R.P.E.Q. No. DATE
CAD FILE	49-0954-SetO.dwg		Original Signed by D.WHITE 03.12
Q.U.U. FILE No.			DESIGN CHECK R.P.E.Q. No. DATE

APPROVED BY SIGNATURE DATE
CONSTRUCTION MANAGER SIGNATURE DATE

ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
POWER DISTRIBUTION SCHEMATIC DIAGRAM

SHEET No. 2 OF 11
QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-002
AMEND. 2


DC PWR
TO BATTERY SEE SHEET 02
13.8VDC SUPPLY FROM CONVERTER - SEE SHEET 02
FROM 240VAC/24VDC POWER SUPPLY
TO 24/13.8VDC CONVERTER FOR RADIO
13.8VDC SUPPLY TO RADIO
24VDC TO RTU E3 CONNECTOR
REFER TO SHEET 02
MULTITRODE RELAY K1
MULTITRODE RELAY K2
TO MAIN ACTUATOR
TO FLOWMETER
SPARE - RESERVED FOR BYPASS ACTUATOR
SPARE - RESERVED FOR GSM MODEM
SPARE - RESERVED FOR PSTN MODEM
CABINET LIGHT
SUMP PUMP
REFER TO SHEET 02
RTU eNET REFER SHT 02
DI1
DIGITAL INPUTS
DI1-COM
BATTERY SYSTEM OK
RTU POWER OK
SOLAR PANEL SWITCHBOARD
SECURITY - DOOR STATUS CLOSED = DOOR CLOSED
SUMP PUMP RUNNING
MAINS POWER OK
SURGE PROTECTION OK
DO1
DIGITAL OUTUTS
PUMP INHIBIT RELAY
CONT'D ON SHT 04
CONT'D ON SHT 04
24VDC SUPPLY
CONT'D ON SHEET 04
SWITCHBOARD
FIELD
PIT FLOODED RELAY K1
MULTITRODE MTRS
24VDC
24VDC REF 03B4
C06
SUMP LEVEL HIGH HIGH ELECTRODE
C07
RTU PILOT VALVE ACTIVE
SENSOR INSTALLATION TBC ON SITE
C08
SUMP LEVEL HIGH ELECTRODE
C09
SUMP LEVEL LOW ELECTRODE
MTR K2 REF 02H9
LEVEL CONTROL RELAY K2
MULTITRODE MTRS
24VDC
24VDC REF 03B4
C08A
C09A
NOTES
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LEGEND:
SWITCHBOARD POWER TERMINAL
SWITCHBOARD CONTROL TERMINAL
FIELD DEVICE TERMINAL
FIELD MARSH. PANEL TERMINAL
PLC TERMINAL
RTU TERMINAL
VFD TERMINAL
PLC/RTU MARSH. FUSE TERMINAL
PLC/RTU MARSH. LINK TERMINAL
DI1-02 RTU DIGITAL INPUT
DO1-02 RTU DIGITAL OUTPUT
AI1-02 RTU ANALOGUE INPUT
AO1-02 RTU ANALOGUE OUTPUT
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RPEQ No. or LICENCE: C20186
COMPANY NAME: SJ ELECTRIC
START DATE: JUNE, 2011 FINISH DATE: APRIL, 2012
SJ ELECTRIC QUEENSLAND
NAME SIGNATURE DATE
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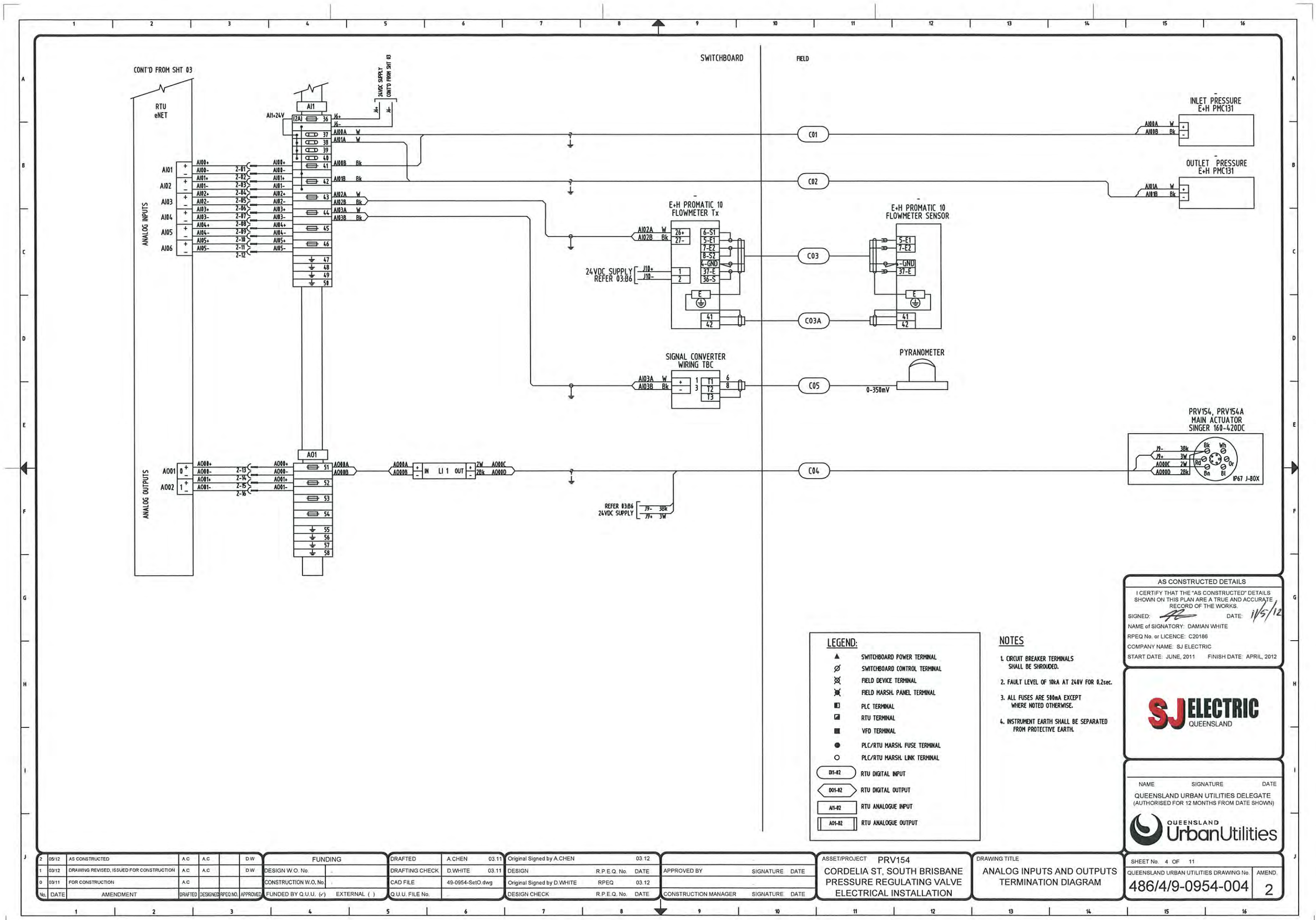
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)
QUEENSLAND UrbanUtilities
2 05/12 AS CONSTRUCTED A.C A.C D.W
1 03/12 DRAWING REVISED, ISSUED FOR CONSTRUCTION A.C A.C D.W
0 03/11 FOR CONSTRUCTION A.C
No. DATE AMENDMENT DRAFTED DESIGNED RPEQ NO. APPROVED
FUNDING
DESIGN W.O. No.
CONSTRUCTION W.O. No.
FUNDED BY Q.U.U. (✓) EXTERNAL ( )
DRAFTED A.CHEN 03.11
DRAFTING CHECK D.WHITE 03.11
CAD FILE 49-0954-Seto.dwg
Q.U.U. FILE No.
Original Signed by A.CHEN 03.12
DESIGN R.P.E.Q. No. DATE
Original Signed by D.WHITE RPEQ 03.12
DESIGN CHECK R.P.E.Q. No. DATE
APPROVED BY SIGNATURE DATE
CONSTRUCTION MANAGER SIGNATURE DATE
ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION
DRAWING TITLE
DIGITAL INPUTS AND OUTPUTS TERMINATION DIAGRAM
SHEET No. 3 OF 11
QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-003
AMEND. 2



LEGEND:

- SWITCHBOARD POWER TERMINAL
- SWITCHBOARD CONTROL TERMINAL
- FIELD DEVICE TERMINAL
- FIELD MARSH. PANEL TERMINAL
- PLC TERMINAL
- RTU TERMINAL
- VFD TERMINAL
- PLC/RTU MARSH. FUSE TERMINAL
- PLC/RTU MARSH. LINK TERMINAL
- DI1-02 RTU DIGITAL INPUT
- DO1-02 RTU DIGITAL OUTPUT
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- AO1-02 RTU ANALOGUE OUTPUT

NOTES

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RPEQ No. or LICENCE: C20186

COMPANY NAME: SJ ELECTRIC

START DATE: JUNE, 2011 FINISH DATE: APRIL, 2012

SJ ELECTRIC QUEENSLAND

NAME SIGNATURE DATE

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CONSTRUCTION W.O. No.
FUNDED BY Q.U.U. (✓) EXTERNAL ( )

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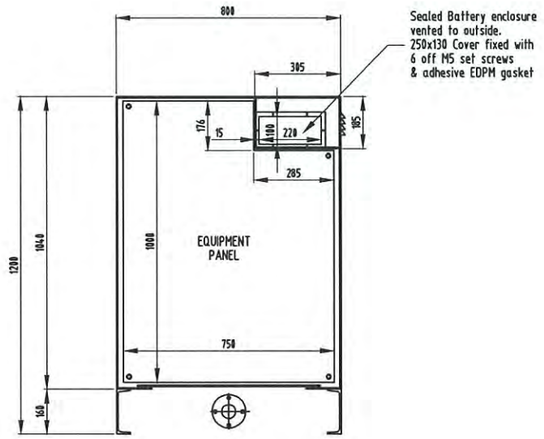
DRAFTING CHECK	D.WHITE	03.11	DESIGN R.P.E.Q. No. DATE
CAD FILE	49-0954-SetO.dwg		Original Signed by D.WHITE RPEQ 03.12
Q.U.U. FILE No.			DESIGN CHECK R.P.E.Q. No. DATE

APPROVED BY SIGNATURE DATE
CONSTRUCTION MANAGER SIGNATURE DATE

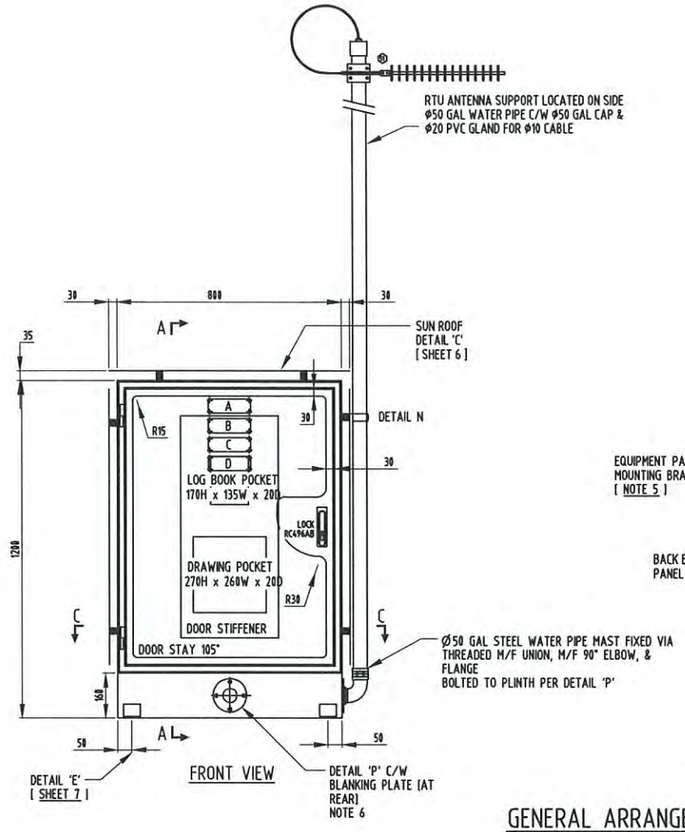
ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
ANALOG INPUTS AND OUTPUTS
TERMINATION DIAGRAM

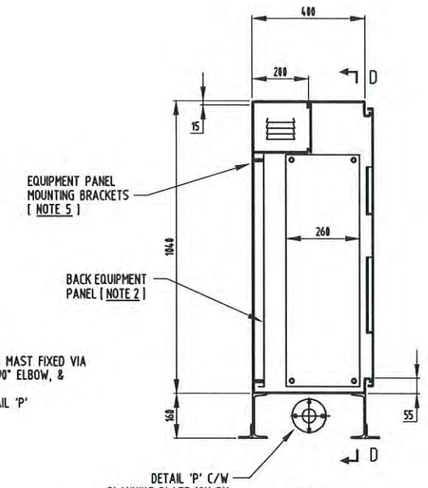
SHEET No. 4 OF 11
QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-004
AMEND. 2



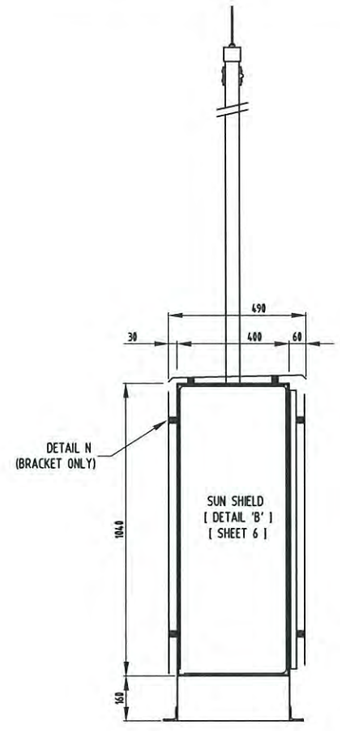
SECTION D-D
[REFER DRG SHT 07]



FRONT VIEW



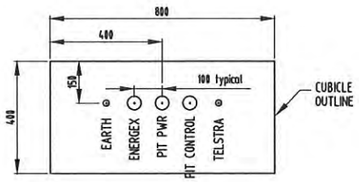
SECTION A-A



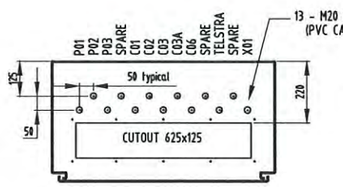
LEFT VIEW

GENERAL ARRANGEMENT

SCALE: 1/10 ON A1 SIZE PRINT

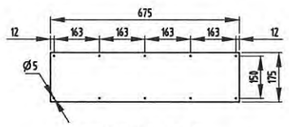


SLAB CONDUIT LOCATIONS
Ø25 & Ø50 PVC CONDUITS



FLOOR CUTOUTS
FOR CABLE ENTRY & INSPECTION ACCESS

SECTION C-C



INSPECTION PLATE
3mm AL + GASKET + M4 SCREWS

NOTES:

1. REFER TO SHEET 06 FOR THE SWITCHBOARD CONSTRUCTION DETAILS.
2. SIDE & BACK EQUIPMENT PANELS TO BE MOUNTED 40mm OFF THE SIDE & BACK WALLS AND OPEN AT BOTH THE TOP AND BOTTOM TO ALLOW FOR AIR FLOW.
3. REFER TO SHEET 07 FOR THE EQUIPMENT PANEL LAYOUT DETAIL AND EQUIPMENT SCHEDULE.
4. BACK & SIDE GEAR MOUNTING BRACKETS [6 OFF TOTAL] [25 X 25 X 3 (TYP.)].
5. THIS DRAWING TO BE READ IN CONJUNCTION WITH SHEET 06, FOLLOWING.
6. ANTENNA FLANGE MOUNTING DETAILS:- WHERE NO ANTENNA IS TO BE INSTALLED, PROVIDE Ø120 BLANKING PLATES WITH GASKETS, TO COVER SIDE AND REAR ANTENNA FLANGE DRILLING POSITIONS.

AS CONSTRUCTED DETAILS

I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS

SIGNED: 11/5/12 DATE:

NAME of SIGNATORY: DAMIAN WHITE

RPEQ No. or LICENCE: C20186

COMPANY NAME: SJ ELECTRIC

START DATE: JUNE, 2011 FINISH DATE: APRIL, 2012

SJ ELECTRIC QUEENSLAND

NAME SIGNATURE DATE

QUEENSLAND URBAN UTILITIES DELEGATE
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

QUEENSLAND UrbanUtilities

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FUNDING	
DESIGN W.O. No.	
CONSTRUCTION W.O. No.	
FUNDED BY Q.U.U. (✓) EXTERNAL ( )	

DRAFTED	A.CHEN	03.11
DRAFTING CHECK	D.WHITE	03.11
CAD FILE	49-0954-SetO.dwg	
Q.U.U. FILE No.		

Original Signed by A.CHEN			03.12
DESIGN	R.P.E.Q. No.		DATE
Original Signed by D.WHITE	REPQ5192		03.12
DESIGN CHECK	R.P.E.Q. No.		DATE

APPROVED BY	SIGNATURE	DATE
CONSTRUCTION MANAGER	SIGNATURE	DATE

ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
PRV SWITCHBOARD
GENERAL ARRANGEMENT

SHEET No. 5 OF 11

QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-005

AMEND. 2

CONSTRUCTION

Cubicle construction 3mm Marine grade Aluminium (5251).
Plinth construction 160x60 channel 6061 T6 Grade Aluminium.
Folded, "Pulse MIG" & "TIG welded with all visible seams and joints fully welded, free from splatter and ground smooth where needed.
External doors and covers fitted with Emka 1011-207 self grip seal.
"D" Handles fitted where indicated on the drawings.
M6 Earth studs fixed to the interior of all doors and hinged escutcheons and on adjacent cubicle interior surfaces.
Door stiffeners, door stays, cable straps, and document holders etc fitted where shown on the drawings.
Lift-off covers and mounting panels fixed with M8 studs & chrome acorn nuts.
Gland plates manufactured from 6mm Bakelite.
Gland plate openings reinforced with 25x6mm flat aluminium bar.
Gland plate seals attached to cubicle not gland plate.
Gland plate fixings are NOT more than 150 mm apart
Hinges Selectrix HI-B650.
Star washers fitted under all hinge screws.

Lock Door
Selectrix 1107 - PSCU1 handle
Selectrix 1107-U123 3pt cam
Lockwood 71 Barel Lock
Emka 1049-U3 roller rod
Lock Code RC496AB

PAINTING

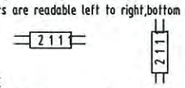
Aluminium Surface Preparation.
Finish smooth all exposed welds, clean, descale, and degrease all surfaces.
Surfaces pretreatment in accordance with AS 1580 & AS 3715 using
Novax LF acid etch cleaner, Novacoat 12 conversion coating, & clean water rinses
Apply DULUX ALPHATECH 3000 powder coat to manufacturer's recommendations.
CUBICLE & EXTERNAL COMPONENTS :- DULUX Mist Green (36648) matt finish.
INTERIOR ITEMS (mounting panels, escutcheons, etc.) :- DULUX Bright White (32166)
Minimum Dry Film Thickness all surfaces 40 microns.

OPERATING PARAMETERS

Standard	AS 3439.1
Current & Frequency	AC 50Hz
Rated Operational Voltage Ue	240 VAC
Rated Insulation Voltage Ui	660 V
Rated Auxiliary Voltage	24 VDC / 240 VAC
Rated Current (Main Bus)	N/A
Short Circuit Current Isc	10 kA
Duration of Isc	1 sec
Degree of Protection	IP 55 to AS 1939
Measure of Protection by barriers and enclosures	
Service Conditions	Outdoors
Mass	Not exceeding 200kg
Forms of Segregation	Form 1
Earthing System	TN-S

WIRING

All wiring to be PVC V90 HT 0.6/1Kv Grade with tinned conductor.
Control and instrumentation wiring has flexible copper conductors, and is colour coded as detailed below, numbered each end, and terminated by the use of appropriate pre-insulated crimp lugs.
Power wiring to be minimum 2.5sqmm stranded copper conductors, phase colour coded as detailed below.
Low level instrumentation signals & 4-20mA signals wired in shielded pair minimum size 0.5sqmm. Earthed at one end only.
Earth cables minimum 2.5sqmm flexible.
Doors and hinged escutcheons bonded with 4sqmm flexible earth strap.
Wire numbering will be equal to Grafoplast SI2000 system.
Wire numbers are readable left to right,bottom to top as shown.



COLOUR CODE

Phase wiring (A,B &C)	Red, White, Blue	2.5sqmm (min)
Potential Metering (240/415 VAC)	Red, White, Blue, Black	1.5sqmm
Current Metering (Secondary)	Red, White, Blue, Grey	2.5sqmm
240 VAC Control Active	Red	1.5sqmm
240 VAC Neutral	Black	1.5sqmm
24 V ELV Positive	Orange	1.5sqmm
24 V ELV Negative	Violet	1.5sqmm
24 V RTU Positive	Orange	0.5sqmm
24 V RTU Negative	Violet	0.5sqmm
RTU Wiring	Grey	0.5sqmm
Intrinsically safe wiring	Blue	1.5sqmm
Earth	Green/Yellow	2.5sqmm (min)
Door & Escutcheon Earth Bonds	Green/Yellow	4 sqmm

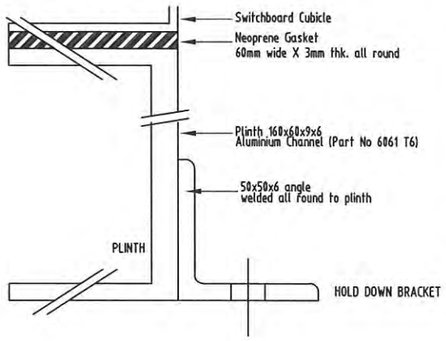
LABELS

Internal labels W/B/W engraved traffolyte to label schedule.
Warning labels R/W/R engraved traffolyte .

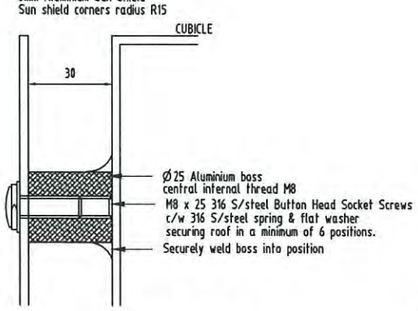
Main switch labels — Material B/W/B

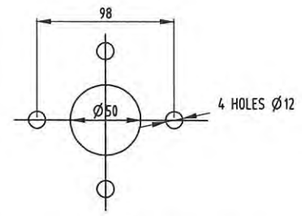
Warning labels — Material R/W/R

Internal labels secured by M3 chrome plated metal threads.
Labels obstructed by switchboard wiring are relocated to adjacent duct lid.
The duct lid is secured by a single cable tie at one corner.
External labels secured by M3 316 stainless steel metal threads.

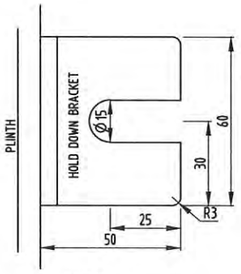


DETAIL B
(SUN SHIELD MOUNTING TO SIDES, REAR AND DOORS)

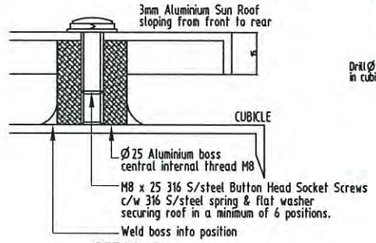




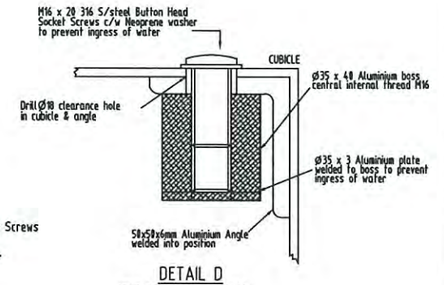
DETAIL P
(FIT 3mm NEOPRENE GASKET BETWEEN PLINTH & FLANGE)
(FIXINGS 316 S/STEEL BOLTS, NUTS, FLAT & SPRING WASHERS)
(AERIAL FLANGE MOUNTING DETAIL)



DETAIL E
(BOLTING DOWN FACILITIES DETAIL)

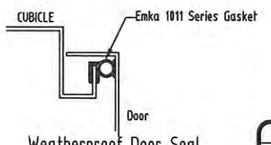


DETAIL C
(SUN ROOF FIXING DETAIL)

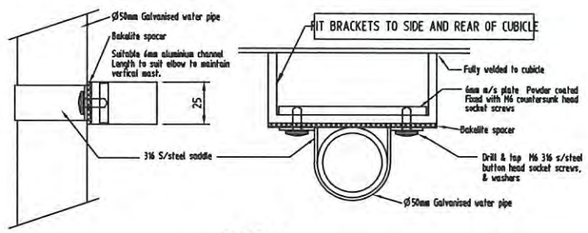


DETAIL D
(EYE BOLT FIXING DETAIL)

SET UP CUBICLE TO BE LEVEL & PLUMB BEFORE BOLTING TO CONCRETE PLINTH USING M12 BOLTS



Weatherproof Door Seal



DETAIL N
(AERIAL SUPPORT BRACKET DETAIL)

AS CONSTRUCTED DETAILS

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SIGNED: DATE: 11/5/12
NAME of SIGNATORY: DAMIAN WHITE
RPEQ No. or LICENCE: C20186
COMPANY NAME: SJ ELECTRIC
START DATE: JUNE, 2011 FINISH DATE: APRIL, 2012

SJ ELECTRIC QUEENSLAND

NAME SIGNATURE DATE
QUEENSLAND URBAN UTILITIES DELEGATE
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)
QUEENSLAND UrbanUtilities

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0	03/11	FOR CONSTRUCTION	A.C			

FUNDING
DESIGN W.O. No.
CONSTRUCTION W.O. No.
FUNDED BY Q.U.U. (✓) EXTERNAL ( )

DRAFTED	A.CHEN	03.11	Original Signed by A.CHEN 03.12
DRAFTING CHECK	D.WHITE	03.11	DESIGN R.P.E.Q. No. DATE
CAD FILE	49-0954-SetO.dwg		Original Signed by D.WHITE RPEQ5192 03.12
Q.U.U. FILE No.			DESIGN CHECK R.P.E.Q. No. DATE

APPROVED BY SIGNATURE DATE
CONSTRUCTION MANAGER SIGNATURE DATE

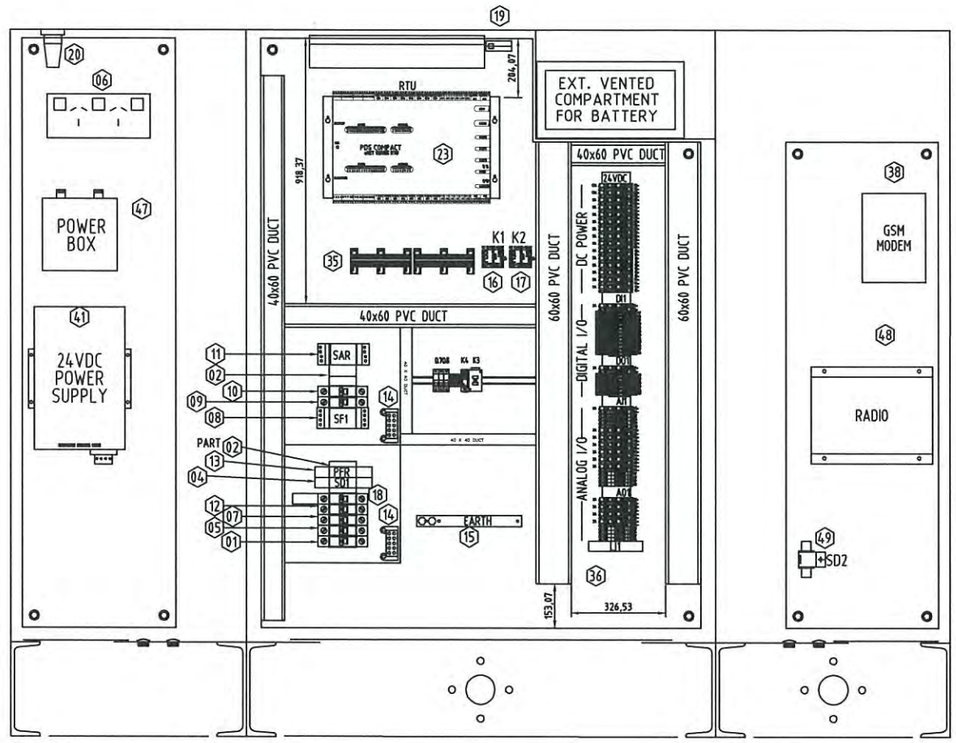
ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
SWITCHBOARDS
CONSTRUCTION DETAILS

SHEET No. 6 OF 11
QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-006
AMEND. 2

EQUIPMENT LIST

REF	QTY	DESCRIPTION	MANUFACTURER	CATALOGUE No	REMARKS
01	1	Q1 - MAIN CIRCUIT BREAKER	TERASAKI	DTCB10_16	10kA
02	5	POLE FILLER	TERASAKI	DT POLE FILLER	
03	2	IP30 8 POLE COVER	TERASAKI	DTPC8	
04	1	SD1 - SURGE DIVERTER	NHP	TITIAN DR1P45K230DC	45KA MAX
05	1	Q2 - GPO CIRCUIT BREAKER	TERASAKI	DTCB10_02	
06	1	GPO - COMPUTER OUTLET 30mA RCD	CLIPSAL	2A CB + RCD	
07	1	Q3 - SURGE FILTER CIRCUIT BREAKER	TERASAKI	DTCB10_06	
08	1	SF1 - SURGE FILTER	CRITEC	DSF-6A-275	
09	1	Q4 - PWR SUPPLY CIRCUIT BREAKER	TERASAKI	DTCB10_04	
10	1	Q5 - SURGE ALARM RLY CIRCUIT BREAKER	TERASAKI	DTCB10_02	
11	1	SAR- SURGE PROTN ALARM RLY	CRITEC	DAR-275V	
12	1	Q6 - POWER FAILURE RLY CIRCUIT BREAKER	TERASAKI	DTCB10_02	
13	1	PFR - POWER FAILURE RELAY	TERASAKI	DTC20-20-240	
14	2	NEUTRAL LINK	CLIPSAL	LA6	
15	1	EARTH LINK	CLIPSAL	BP165D18	
16	1	K1 - PRV PIT LEVEL RELAY	MULTITRODE	MTR-5	24VDC
17	1	K2 - LEVEL CONTROL RELAY	MULTITRODE	MTR-5	24VDC
18	1	Q7 - SUMP PUMP CIRCUIT BREAKER (30mA RCD)	TERASAKI	DSRCBH-06-30A	
19	2	SW/BD DOOR MICRO SWITCHES	CAMSCO	SM202	1 OFF N/O 1 OFF N/C
20					
21	1	CORROSION INHIBITOR	CORTEC	VPCI-110 OR 111	FROM AP CONTROLS
22	1	RTU	SERCK	eNET -5XEW-EI	eNET RTU WITH 1/2 I.O., 10-30V INPUT.
23	2	DISCONNECT PLUGS	PHOENIX CONTACT	MSTB 2,5/20-ST-5.08	
24	2	DISCONNECT BLOCKS	PHOENIX CONTACT	UMSTBVK2,5/20-G-5.08	
25	2	CABLE HOUSING	PHOENIX CONTACT	KGS-MSTB2.5/20	
26	1	CODING PINS	PHOENIX CONTACT	CP-MSTB + CR-MSTB	
27	Lot	FUSED TERMINALS with LED 24V INDICATION	PHOENIX CONTACT	UT4-HESI LED24 (5x20)	
28	Lot	FUSE CARTRIDGES	PHOENIX CONTACT	M205	RATINGS AS REQUIRED
29	Lot	DISCONNECT TERMINALS	PHOENIX CONTACT	UT4-MT P/P	
30	Lot	TERMINALS	PHOENIX CONTACT	UT4-?	
31	8	EARTH TERMINALS	PHOENIX CONTACT	UT4-MTD-PE/S	
32	6	GROUP MARKER CARRIER	PHOENIX CONTACT	UBE	
33	2	TEST PLUG ADAPTOR	PHOENIX CONTACT	PS-6	
34	1	SCREW DRIVER	PHOENIX CONTACT	SZS 0.6 x 3.5	
35	Lot	PLUG-IN BRIDGE	PHOENIX CONTACT	FBS	AS REQUIRED
36	1	LOOP ISOLATOR 4-20/4-20mA	WEIDMULLER	7940005521	(MAIN)
37	2	PRESSURE TRANSDUCER	E+H PMC131	IP68 4-20mA	FREE ISSUED - EXTERNAL TO SWBD ON SITE
38					
39	4				
40					
41	1	PS1 - RTU 24VDC POWER SUPPLY	POWERBOX	PB251-24CM-CC-T	
42					
43	1	SIGNAL CONVERTED 0-400mV TO 4-20mA/WEIDMULLER	7940016006	ITX SERIES	
44	1	PYRANOMETER	DECAGON DEVICE	PYR SOLAR RADIATION	ICT INTERNATIONAL
45					
46					
47	1	24V/12V DC CONVERTER	POWERBOX	PBIH-2412G	
48	1	RADIO	TRIO	ER450-53A02-EH0	
49	1	SD2 - RADIO COAX SURGE PROTECTOR	POLYPHASER CORPORATION	IS-50NX-C2	
50	1	ANTENNA MAST	SWBD MANUFACTURER		6 METRES
51	1	ANTENNA	POLAR INDUSTRIES	326 DIRECTIONAL YAGI	CENTRE FREQUENCY 483MHz
52	1	COAX CABLE (INTERNAL)	TRIO	NM/NM/TL23	N-TYPE MALE TO N-TYPE MALE RG233 FEEDER TAIL 500mm LONG
53	1	COAX CABLE (EXTERNAL)	R.F. INDUSTRIES	RG213	SUPPLIED LOOSE BY SWBD MFR & FITTED ON SITE
54					
55					
56	2	COAX CABLE PLUG	R.F. INDUSTRIES	N07 (MALE)	SUPPLIED LOOSE BY SWBD MFR & FITTED ON SITE
57	1	MAST CLAMPS	POLAR INDUSTRIES	P18	
58					
59	1	MAGNETIC FLOW METER TRANSMITTER	E+H PROMATIC 10	24VDC	FREE ISSUED TO SWBD MFR
60	1	ELECTRONIC ACTUATOR	SINGER	160-420DC	EXTERNAL TO SWITCHBOARD
61	1	240VAC SUMP PUMP	DANFOSS	KP150 50Hz 240VAC	EXTERNAL TO SWITCHBOARD
62					



LEFT SIDE EQUIPMENT PANEL | BACK EQUIPMENT PANEL | RIGHT SIDE EQUIPMENT PANEL

EQUIPMENT PANEL - LAYOUT DETAIL

SCALE: 1/5 ON A1 SIZE PRINT

NB:-
INDICATING LIGHTS ON THE 24V DC POWER SUPPLY AND THE RADIO MUST FACE UPWARDS.

NOTES:

1.0 LABELS FITTED ADJACENT ASSOCIATED EQUIPMENT

2.0 LABELS OBSTRUCTED BY SWITCHBOARD WIRING ARE RELOCATED TO ADJACENT DUCT LID. DUCT LIDS LOCATED BY SINGLE CABLE TIE AT ONE CORNER

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SJ ELECTRIC QUEENSLAND

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APPROVED BY SIGNATURE DATE

CONSTRUCTION MANAGER SIGNATURE DATE

ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
PRV SWITCHBOARD
EQUIPMENT LIST

SHEET No. 7 OF 11

QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-007

AMEND. 2

CABLE SCHEDULE

CABLE No.	SIZE mm²	CORES	TYPE	LENGTH (metres)	FROM - TO - VIA ROUTE	CABLE FUNCTION	REMARKS
P01	4	2	PVC/PVC/CIRC	site specific	ENERGEX Pole to new RTU enclosure	Incoming Mains	Electrical Installation Contractor
P02	10		Building wire	1	Earth stake to RTU earth bar	Main earth	Electrical Installation Contractor
P03	2.5	2C+E	PVC/PVC/CIRC	site specific	SwBd Terminal strip to PRV pit 240VAC SUMP PUMP IP68 JBOX	SUMP PUMP	Electrical Installation Contractor
X01			Coax	1	New switchboard radio to aerial coax surge protector	Radio Communications	Switchboard Manufacturer
X02			Coax	7	Aerial coax surge protector to antenna	Radio Communications	Switchboard Manufacturer
X03		6	Special	2	Radio to RTU Port 1	Communications	Switchboard Manufacturer
X04							
C01	1.5	1 PAIR	DEKORON	site specific	RTU terminal strip to pressure transmitter	Pressure 1 Tx signal	Switchboard Manufacturer
C02	1.5	1 PAIR	DEKORON	site specific	RTU terminal strip to pressure transmitter	Pressure 2 Tx signal	Switchboard Manufacturer
C03	N/A	N/A	Special	site specific	Flowmeter Sensor to Flowmeter Transmitter	Flowmeter Sensor	FREE ISSUE
C03A	N/A	N/A	Special	site specific	Flowmeter Sensor to Flowmeter Transmitter	Flowmeter Sensor	FREE ISSUE
C04	1.5	4 PAIR	DEKORON	site specific	RTU enclosure to Electronic Actuator (Main) in valve pit	Valve Control	Electrical Installation Contractor
C05							
C06	1.5	2	PVC/PVC/CIRC	site specific	SwBd Terminal strip to PRV pit HI LEVEL PROBE	WATER IN PIT HI LEVEL	Electrical Installation Contractor
C07	1.5	2	PVC/PVC/CIRC	site specific	SwBd Terminal strip to PRV pit VALVE POSITION LIMIT SWITCH	RTU PILOT VALVE ACTIVE	Electrical Installation Contractor

EQUIPMENT LABEL LIST

REF	TEXT HEIGHT mm / MATERIAL	TEXT LINE 1 / TEXT LINE 2
45	4mm / WBW TRAFFOLYTE	- INLET ZONE PRESSURE
45	4mm / WBW TRAFFOLYTE	- OUTLET ZONE PRESSURE
48	4mm / WBW TRAFFOLYTE	- FLOWMETER
49	4mm / WBW TRAFFOLYTE	SD2 - RADIO SURGE DIVERTER

EQUIPMENT LABEL LIST

REF	TEXT HEIGHT mm / MATERIAL	TEXT LINE 1 / TEXT LINE 2
01	10mm / 4mm / WBW TRAFFOLYTE	MAIN SWITCH / Q1 - 16A
04	4mm / WBW TRAFFOLYTE	SD1 - SURGE DIVERTER
05	4mm / WBW TRAFFOLYTE	Q2 - LAPTOP GPO - 2A
06	4mm / WBW TRAFFOLYTE	2Amp LAPTOP ONLY
07	4mm / WBW TRAFFOLYTE	Q3 - SURGE FILTER - 6A
08	4mm / WBW TRAFFOLYTE	SF1 - SURGE FILTER
09	4mm / WBW TRAFFOLYTE	Q4 - 24V PWR SUPPLY - 4A
10	4mm / WBW TRAFFOLYTE	Q5 - SURGE ALM RLY - 2A
11	4mm / WBW TRAFFOLYTE	SAR - SURGE ALM RLY
12	4mm / WBW TRAFFOLYTE	Q6 - POWER FAIL RLY - 2A
13	4mm / WBW TRAFFOLYTE	PFR - POWER FAIL RLY
14	4mm / WBW TRAFFOLYTE	NEUTRAL
15	4mm / WBW TRAFFOLYTE	EARTH
18		
19	4mm / WBW TRAFFOLYTE	PS1 - 24VDC10A PWR SUPPLY
20	4mm / WBW TRAFFOLYTE	24/13.8VDC CONVERTER
21	4mm / WBW TRAFFOLYTE	BATTERY COMPARTMENT
22	4mm / WBW TRAFFOLYTE	RTU
24	4mm / WBW TRAFFOLYTE	K1 - PRV PIT LEVEL RLY
25		
28		
29		
45		

EXTERNAL LABELS

LABEL	TEXT	TEXT HEIGHT	PAINT FILL LETTERING	DIMENSIONS	QTY
A	PRV154	20mm	BLACK	150X35	1
B	WARNING THIS SITE IS MONITORED BY THE CONTROL ROOM OPERATOR PLEASE INFORM THE OPERATOR BEFORE ISOLATING STATION	8mm	BLACK	250X100	1
C	DANGER 240V	8mm	RED	120X15	1
D	REMINDER: THIS IS AN UN-METERED SUPPLY AND ANY ALTERATIONS TO THESE CIRCUITS MUST BE NOTIFIED TO SUPPLY AUTHORITY BILLING DEPARTMENT.	3mm	BLACK	TO SUIT	1
A	PRV154A	20mm	BLACK	150X35	1

EXTERNAL LABELS 1mm THK. 316 GRADE STAINLESS STEEL.
FIXED WITH M3 316 STAINLESS STEEL METAL THREADS.

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COMPANY NAME: SJ ELECTRIC

START DATE: JUNE, 2011 FINISH DATE: APRIL, 2012

SJ ELECTRIC QUEENSLAND

NAME SIGNATURE DATE

QUEENSLAND URBAN UTILITIES DELEGATE
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Original Signed by A.CHEN	.			03.12
DESIGN	R.P.E.Q. No.		DATE	
Original Signed by D.WHITE	RPEQ			03.12
DESIGN CHECK	R.P.E.Q. No.		DATE	

APPROVED BY		SIGNATURE	DATE
	.		
CONSTRUCTION MANAGER		SIGNATURE	DATE

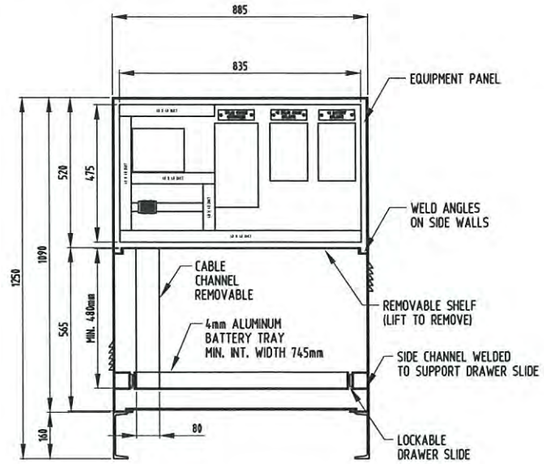
ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
SWITCHBOARD
CABLE & LABEL SCHEDULE

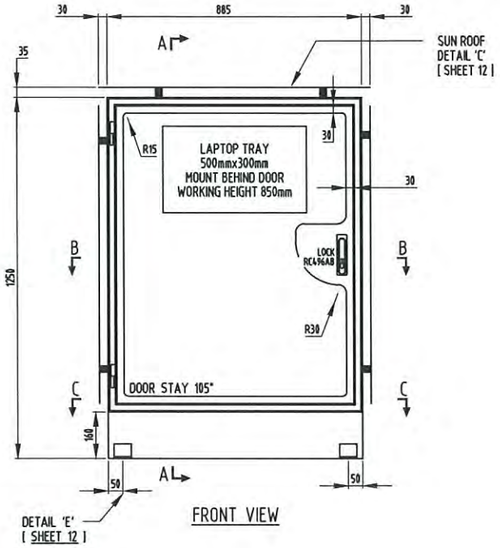
SHEET No. 8 OF 11

QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-008

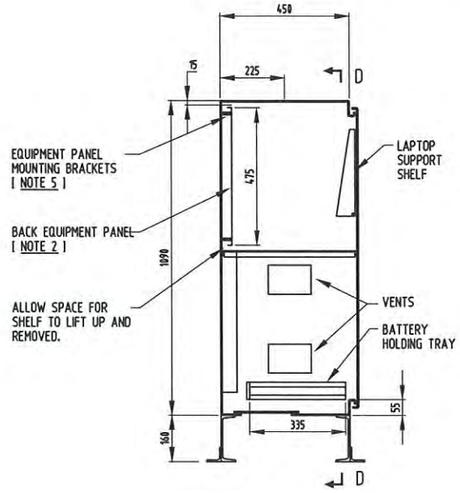
AMEND. 2



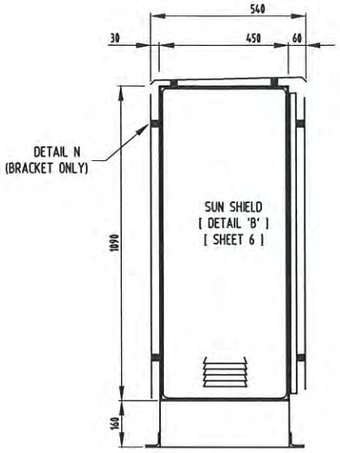
SECTION D-D
[REFER DRG SHT 07]



FRONT VIEW



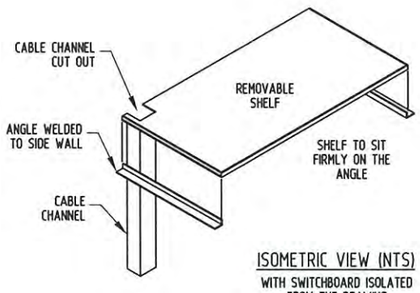
SECTION A-A



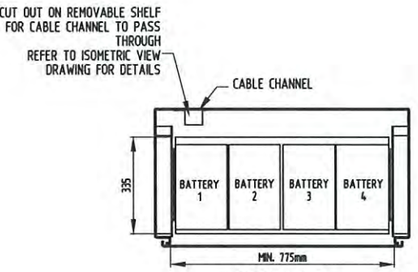
LEFT VIEW

GENERAL ARRANGEMENT

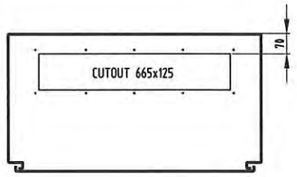
SCALE: 1/10 ON A1 SIZE PRINT



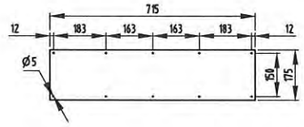
ISOMETRIC VIEW (NTS)
WITH SWITCHBOARD ISOLATED FROM THE DRAWING



SECTION B-B
WITH BATTERY INSIDE SWITCHBOARD



SECTION C-C
FLOOR CUTOUTS
FOR CABLE ENTRY & INSPECTION ACCESS



INSPECTION PLATE
3mm AL + GASKET + M4 SCREWS

NOTES:

1. REFER TO SHEET 06 FOR THE SWITCHBOARD CONSTRUCTION DETAILS.
2. BACK EQUIPMENT PANEL TO BE MOUNTED 40mm OFF THE BACK WALL AND OPEN AT BOTH THE TOP AND BOTTOM TO ALLOW FOR AIR FLOW.
3. REFER TO SHEET FOR THE EQUIPMENT PANEL LAYOUT DETAIL AND EQUIPMENT SCHEDULE.
4. BACK GEAR MOUNTING BRACKETS [6 OFF TOTAL] [25 X 25 X 3 (TYP.)].
5. THIS DRAWING TO BE READ IN CONJUNCTION WITH SHEET 06.
6. BATTERY TRAY TO HAVE MINIMUM INTERNAL WIDE OF 745mm TO FIT IN 4xBATTERIES.

CONSTRUCTION
Cubicle construction 3mm Marine grade Aluminium (5251).
Plinth construction 160x60 channel 6061 T6 Grade Aluminium.
Folded, "Pulse MIG" & "TIG welded with all visible seams and joints fully welded, free from splatter and ground smooth where needed.
External doors and covers fitted with Enka 1011-287 self grip seal.
"D" Handles fitted where indicated on the drawings.
M6 Earth studs fixed to the interior of all doors and hinged escutcheons and on adjacent cubicle interior surfaces.
Door stiffeners, door stays, cable straps, and document holders etc fitted where shown on the drawings.
Lift-off covers and mounting panels fixed with M8 studs & chrome acorn nuts.
Gland plates manufactured from 6mm Bakelite.
Gland plate openings reinforced with 25x6mm flat aluminium bar.
Gland plate seals attached to cubicle not gland plate.
Gland plate fixings are NOT more than 150 mm apart
Hinges Selectrix HI-B650.
Star washers fitted under all hinge screws.

Lock Door
Selectrix 1187 - PSCU1 handle
Selectrix 1187-U123 3pt cam
Lockwood 71 Barel Lock
Enka 1049-U3 roller rod
Lock Code RC496AB

PAINTING
Aluminium Surface Preparation.
Finish smooth all exposed welds, clean, descale, and degrease all surfaces.
Surfaces pretreatment in accordance with AS 1580 & AS 3715 using
Novox LF acid etch cleaner, Novacoat 12 conversion coating, & clean water rinses
Apply DULUX ALPHATECH 3000 powder coat to manufacturer's recommendations.
CUBICLE & EXTERNAL COMPONENTS :- DULUX Mist Green (36640) matt finish.
INTERIOR ITEMS (mounting panels, escutcheons, etc.) :- DULUX Bright White (32964)
Minimum Dry Film Thickness all surfaces 60 microns.

OPERATING PARAMETERS

Standard	AS 3439.1
Current & Frequency	AC 50Hz
Rated Operational Voltage Ue	240 VAC
Rated Insulation Voltage Ui	660 V
Rated Auxiliary Voltage	24 VDC / 240 VAC
Rated Current (Main Bus)	N/A
Short Circuit Current Isc	10 kA
Duration of Isc	1 sec
Degree of Protection	IP 55 to AS 1939
Measure of Protection by barriers and enclosures	
Service Conditions	Outdoors
Mass	Not exceeding 200kg
Forms of Segregation	Form 1
Earthing System	TN-S

WIRING
All wiring to be PVC V90 HT 0.6/1Kv Grade with tinned conductor.
Control and instrumentation wiring has flexible copper conductors, and is colour coded as detailed below, numbered each end, and terminated by the use of appropriate pre-insulated crimp lugs.
Power wiring to be minimum 2.5sqmm stranded copper conductors, phase colour coded as detailed below.
Low level instrumentation signals & 4-20mA signals wired in shielded pair minimum size 0.5sqmm. Earthed at one end only.
Earth cables minimum 2.5sqmm flexible.
Doors and hinged escutcheons bonded with 4sqmm flexible earth strap.
Wire numbering will be equal to Grafoplast S12000 system.
Wire numbers are readable left to right,bottom to top as shown.

COLOUR CODE

Phase wiring (A,B &C)	Red, White, Blue	2.5sqmm (min)
Potential Metering (240/415 VAC)	Red, White, Blue, Black	1.5sqmm
Current Metering (Secondary)	Red, White, Blue, Grey	2.5sqmm
240 VAC Control Active	Red	1.5sqmm
240 VAC Neutral	Black	1.5sqmm
24 V ELV Positive	Orange	1.5sqmm
24 V ELV Negative	Violet	1.5sqmm
24 V RTU Positive	Orange	0.5sqmm
24 V RTU Negative	Violet	0.5sqmm
RTU Wiring	Grey	0.5sqmm
Intrinsically safe wiring	Blue	1.5sqmm
Earth	Green/Yellow	2.5sqmm (min)
Door & Escutcheon Earth Bonds	Green/Yellow	4 sqmm

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(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)
QUEENSLAND UrbanUtilities

No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED
1	01.05.12	AS CONSTRUCTED	A.C	A.C		D.W
0	05.03.12	DRAWING REVISED, ISSUED FOR CONSTRUCTION	A.C	A.C		D.W

FUNDING
DESIGN W.O. No.
CONSTRUCTION W.O. No.
FUNDED BY Q.U.U. (✓) EXTERNAL ( )

DRAFTED	A.CHEN	03.11	
DRAFTING CHECK	D.WHITE	03.11	
CAD FILE	49-0954-SetO.dwg		
Q.U.U. FILE No.			

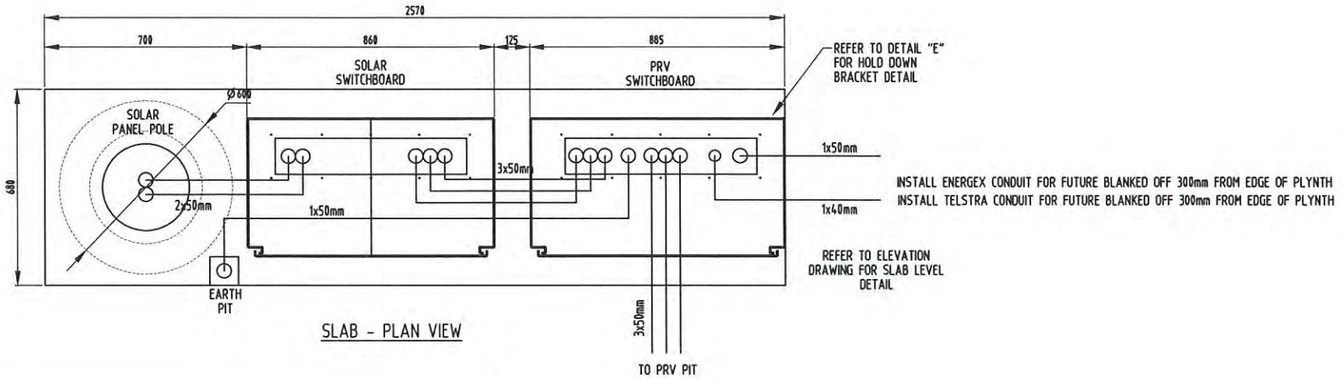
Original Signed by A. CHEN			03.12
DESIGN	R.P.E.Q. No.		DATE
Original Signed by D.WHITE	RPEQ		03.12
DESIGN CHECK	R.P.E.Q. No.		DATE

APPROVED BY SIGNATURE DATE
CONSTRUCTION MANAGER SIGNATURE DATE

ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
SOLAR PANEL SWITCHBOARD GENERAL ARRANGEMENT

SHEET No. 9 OF 11
QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-009
AMEND. 1

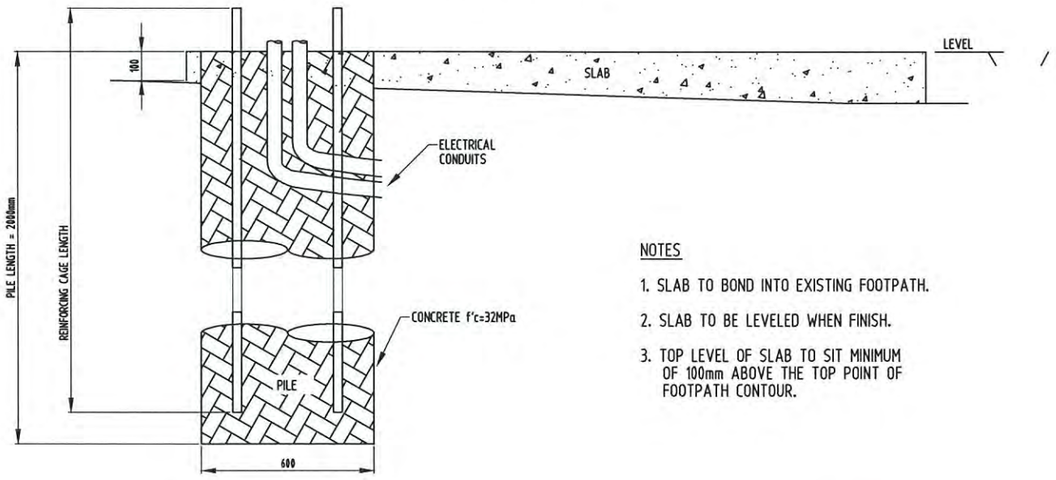


SLAB - PLAN VIEW

CONDUIT SCHEDULE:

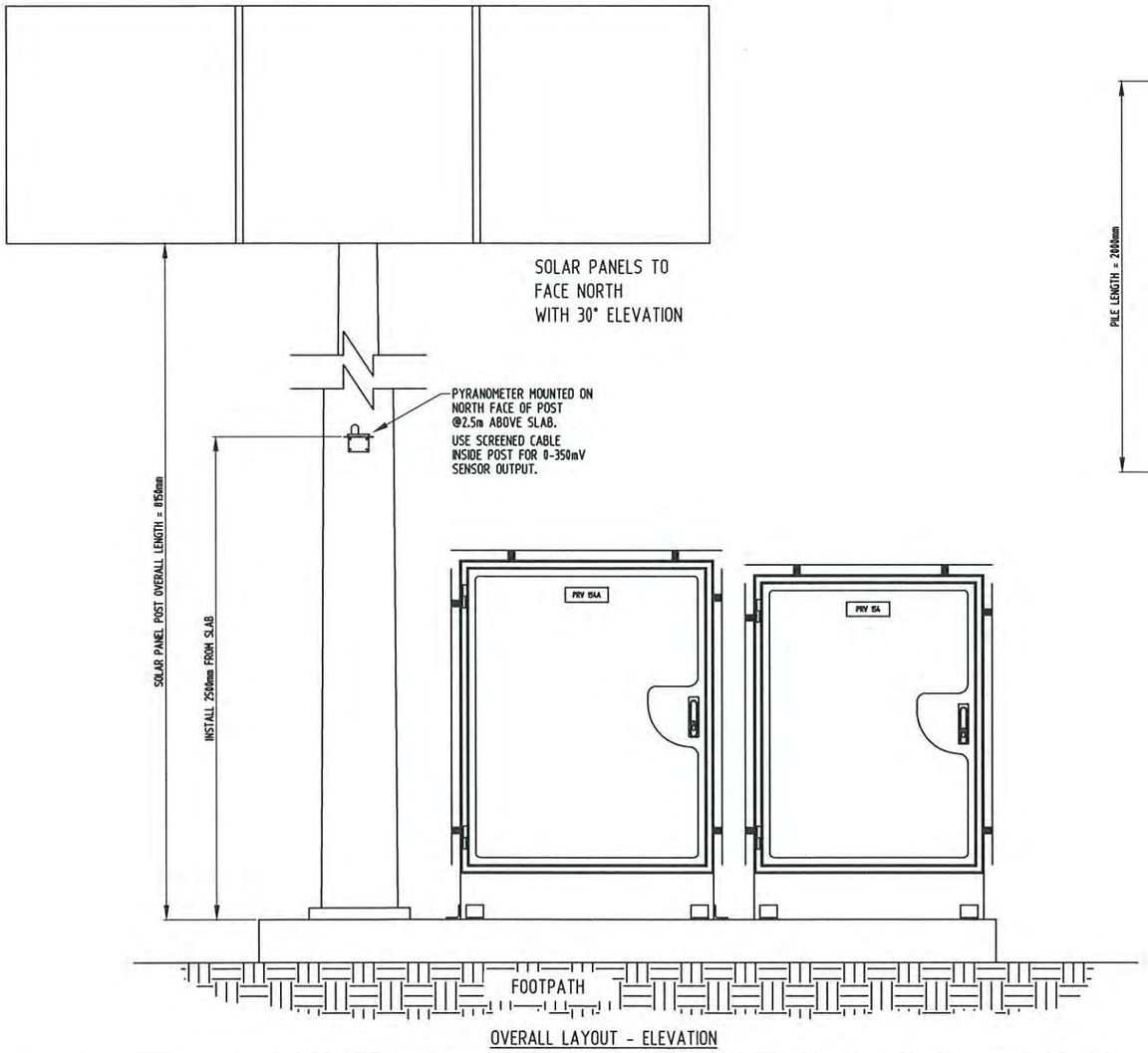
QTY	CONDUIT SIZE	FROM	TO
2	50mm	SOLAR POLE	SOLAR SWB
3	50mm	SOLAR SWB	PRV SWB
1	50mm	PRV SWB	EARTH PIT
3	50mm	PRV SWB	PRV PIT
1	50mm	PRV SWB	OUTSIDE SLAB FOR ENERGEX
1	40mm	PRV SWB	OUTSIDE SLAB FOR PHONE

SLAB - ELEVATION



NOTES

1. SLAB TO BOND INTO EXISTING FOOTPATH.
2. SLAB TO BE LEVELED WHEN FINISH.
3. TOP LEVEL OF SLAB TO SIT MINIMUM OF 100mm ABOVE THE TOP POINT OF FOOTPATH CONTOUR.



OVERALL LAYOUT - ELEVATION

AS CONSTRUCTED DETAILS

I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: DATE: 11/5/12

NAME of SIGNATORY: DAMIAN WHITE

RPEQ No. or LICENCE: C20186

COMPANY NAME: SJ ELECTRIC

START DATE: JUNE, 2011 FINISH DATE: APRIL, 2012

SJ ELECTRIC QUEENSLAND

NAME SIGNATURE DATE

QUEENSLAND URBAN UTILITIES DELEGATE
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

QUEENSLAND Urban Utilities

No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED
1	01.05.12	AS CONSTRUCTED	A.C	A.C		D.W
0	05.03.12	DRAWING REVISED, ISSUED FOR CONSTRUCTION	A.C	A.C		D.W

FUNDING		DRAFTED	A.CHEN 03.11
DESIGN W.O. No.		DRAFTING CHECK	D.WHITE 03.11
CONSTRUCTION W.O. No.		CAD FILE	49-0954-SetO.dwg
FUNDED BY Q.U.U. (✓)	EXTERNAL ( )	Q.U.U. FILE No.	

Original Signed by A.CHEN			03.12	
DESIGN	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE DATE
Original Signed by D.WHITE	RPEQ	03.12		
DESIGN CHECK	R.P.E.Q. No.	DATE	CONSTRUCTION MANAGER	SIGNATURE DATE

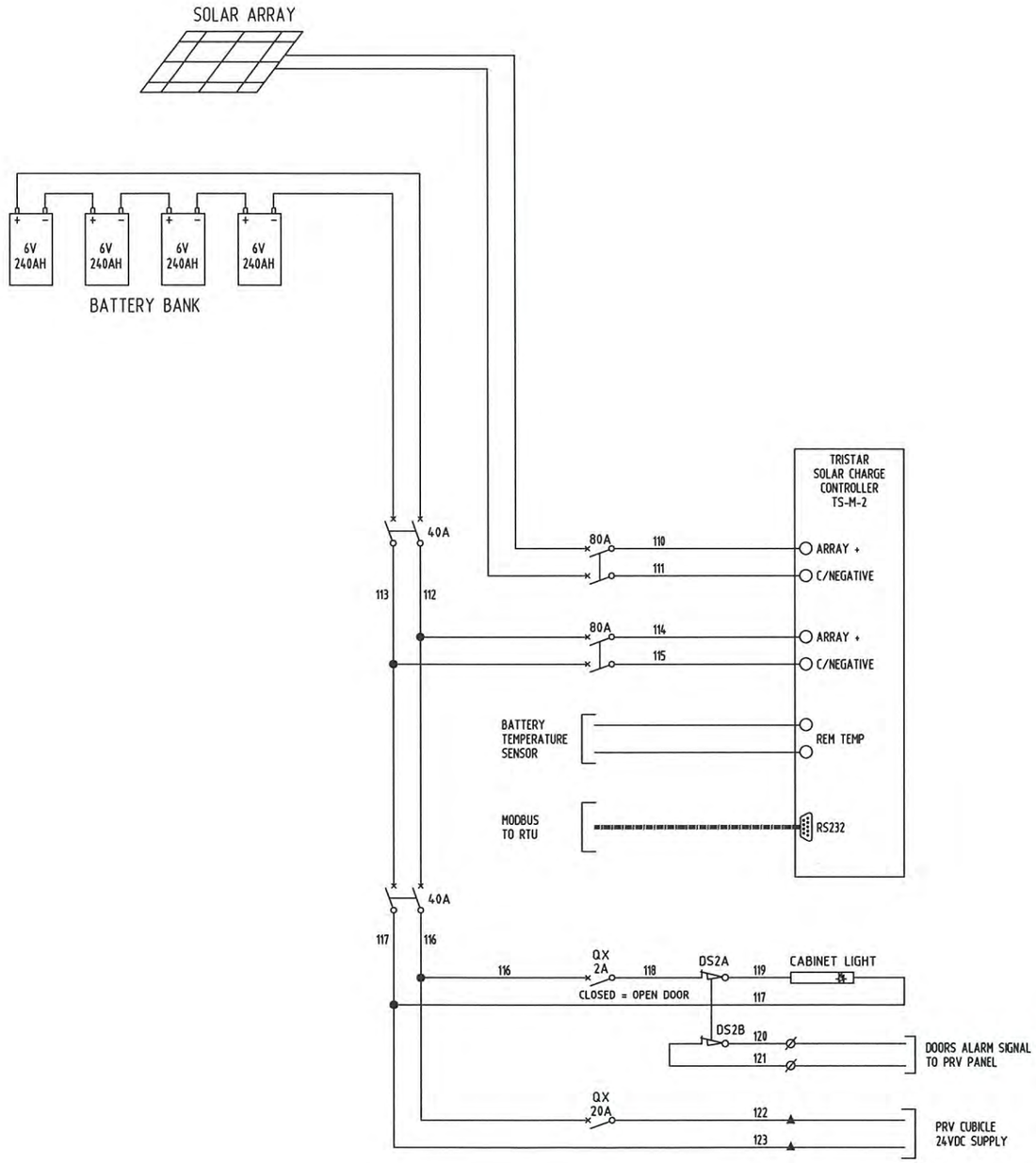
ASSET/PROJECT PRV154
CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE
SITE OVERALL LAYOUT

SHEET No. 10 OF 11

QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-010

AMEND. 1



LEGEND:

- SWITCHBOARD POWER TERMINAL
- SWITCHBOARD CONTROL TERMINAL
- FIELD DEVICE TERMINAL
- FIELD MARSH. PANEL TERMINAL
- PLC TERMINAL
- RTU TERMINAL
- VFD TERMINAL
- PLC/RTU MARSH. FUSE TERMINAL
- PLC/RTU MARSH. LINK TERMINAL
- DI1-R2 RTU DIGITAL INPUT
- DO1-R2 RTU DIGITAL OUTPUT
- AI1-R2 RTU ANALOGUE INPUT
- AO1-R2 RTU ANALOGUE OUTPUT

AS CONSTRUCTED DETAILS

I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: DATE: 11/5/12

NAME of SIGNATORY: DAMIAN WHITE

RPEQ No. or LICENCE: C20186

COMPANY NAME: SJ ELECTRIC

START DATE: JUNE, 2011 FINISH DATE: APRIL, 2012

SJ ELECTRIC QUEENSLAND

NAME SIGNATURE DATE

QUEENSLAND URBAN UTILITIES DELEGATE
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

QUEENSLAND UrbanUtilities

No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED
1	01.05.12	AS CONSTRUCTED	A.C	A.C		D.W
0	05.03.12	DRAWING REVISED, ISSUED FOR CONSTRUCTION	A.C	A.C		D.W

FUNDING			
DESIGN W.O. No.	.	DRAFTED	A.CHEN 03.11
CONSTRUCTION W.O. No.	.	DRAFTING CHECK	D.WHITE 03.11
FUNDED BY Q.U.U. (✓)	EXTERNAL ( )	CAD FILE	49-0954-SetO.dwg
		Q.U.U. FILE No.	.

Original Signed by A.CHEN	.		03.12	
DESIGN	R.P.E.Q. No.		DATE	APPROVED BY
Original Signed by D.WHITE	RPEQ		03.12	.
DESIGN CHECK	R.P.E.Q. No.		DATE	CONSTRUCTION MANAGER

SIGNATURE DATE

SIGNATURE DATE

ASSET/PROJECT PRV154

CORDELIA ST, SOUTH BRISBANE
PRESSURE REGULATING VALVE
ELECTRICAL INSTALLATION

DRAWING TITLE .

HALE STREET
SOLAR PANEL
SWITCHBOARD

SHEET No. 11 OF 11

QUEENSLAND URBAN UTILITIES DRAWING No. 486/4/9-0954-011

AMEND. 1

4. Inspection & Test Results

Inspection and Test Check List

Project: HAWE ST PRV & SOLAR		
Contractor / Order No.		SJ Electric Job No. 43400306
ITC No. 003	Date: 9/3/12	**Corresponding ITP No. 001**

General Data

Built By: GLENN	Test Equipment: INSULATION CONTINUITY TESTER MULTI CLAMP METER
Location Tested: WORKSHOP	Type: KYORITSU 3132A TOPTRONIC T9001 51149622
Drg rev No:	Serial No. 08001466.

Check List (Tick ( ) acceptable items only, note deviations under "REMARKS") (If not applicable mark as N/A)

Switch Board and Control Panels Construction Check List

Item	Activity Description	Hold Points	Checked	By (Initial)
	Busbar			
1	Correct size busbar to rated current load to meet AS 2067		( )	
2	Appearance is good i.e. Straight & level		( )	
3	Correct phase identification		( )	
4	Correct hole sizes for joins and terminations		( )	
5	All clearances have been meet		( )	
6	Correct busbar support material has been used		( )	
7	Busbar supports are at the correct distances apart		( )	
8	Correct tensioning & blue spotted at all joins & terminations		( )	
9	Correct hole format in joining cubicle		( )	
10	Sufficient clearances for terminating cable		( )	
11	Heat shrink attached to flags for terminations		( )	
12	All joins are dressed flat		( )	
13	Busbar is insulated at supports		( )	
	Cabling			
15	Correct size for demand of circuit		(✓)	GB
16	Correct phase colouring		(✓)	GB
17	Correct termination & insulated		(✓)	GB
18	Correct numbering		(✓)	GB
19	Correctly formed and neat		(✓)	GB
20	Correctly supported		(✓)	GB
21	All cable entry holes are insulated		(✓)	GB
22	Check cable tray is mounted correctly & all sharp surfaces are removed		(—)	—
23	All cable ties are neatly trimmed		(✓)	GB
24	All cable clear from busbar's		(—)	—
25	Check all analog inputs and outputs are shielded		(—)	—
26	All shielded cables have been earthed		(—)	—

Remarks/Remedial Action Required Hold Points:

Remedial Actions Completed ☐ **Signature:** ..... **Date:**

Approved By: GLENN BACON	
Signature:	**Checked By:**
Electrical Licence No. 113407	**Signature:** **Date:**

All the above signatories certify that the Electrical switchboard work listed has been checked and tested in accordance with the prescribed procedure and that such work complies in every respect with the requirements of the Electricity Act, AS3000 2007 and AS3008.1.1 1998

Inspection and Test Check List

Switch Board and Control Panels Construction Check List (SJQF 502)				
Item	**Activity Description**	**Hold Points**	**Checked**	**By (Initial)**
	Switchgear			
1	Check all main switches & circuit breakers are the correct			
	• current rating		(✓)	GB
	• ka rating.		(✓)	GB
	• trip settings		(-)	GB
	• correct to cabling		(✓)	GB
	• to labels.		(-)	GB
	• shunt trips		(-)	GB
	• inter locks		(-)	GB
2	Check the fixings		(✓)	GB
3	Check the number of poles		(✓)	GB
4	Check correct operation		(✓)	GB
5	Correct mechanism		(✓)	GB
	Control Switches			
6	~~Check correct number of positions~~		( )	
7	~~Check correct size~~		( )	
8	~~Check correct to labels~~		( )	
9	~~Check mountings~~		( )	
	Contactors			
10	Check for correct model no		(-)	-
11	Check for correct current rating to control		(✓)	GB
12	Correct auxiliary contacts		(✓)	GB
13	Correct phasing		(✓)	GB
14	Correct coil size		(✓)	GB
15	Check that it is accessible		(✓)	GB
16	Check it has correct overloads		(-)	-
17	Correct labelling		(✓)	GB
	Relays and Timers			
18	Check correct rated voltage		(✓)	GB
19	Correct contacts		(✓)	GB
20	Correct variances		(-)	-
21	Dip switches in required position		(-)	-
22	Timers set to correct settings		(-)	-
23	Correct operation		(✓)	GB
24	Correct auxiliaries		(-)	-
	Transformers and Power Supplies			
25	Check for correct voltage ratings		(✓)	GB
26	Check for correct current ratings		(✓)	GB
27	Check cabling is correct (no crossed voltage)		(✓)	GB
28	Check the secondary has been earthed when applicable		(✓)	GB
29	Check correct labelling		(✓)	GB
30	Check mountings		(✓)	GB
31	Check for clearance around for heat extraction		(✓)	GB

Remarks/Remedial Action Required:

Remedial Actions Completed ☐ **Signature:** ..... Date:

Approved By: GLENN BACON	
Signature: Glenn Bacon	**Checked By:** Laurent Lacaille
Electrical Licence No. 113407	**Signature:** **Date:**

All the above signatories certify that the Electrical switchboard work listed has been checked and tested in accordance with the prescribed procedure and that such work complies in every respect with the requirements of the Electricity Act 2002, AS3000 2007 and AS3008.1 1998

Inspection and Test Check List

Switch Board and Control Panels Construction Check List (SJQF 502)				
Item	**Activity Description**	**Hold Points**	**Checked**	**By (Initial)**
	Fuses			
1	Check that the cartridge is correct size		( )	
2	Correct mountings		( )	
3	Correct labelling		( )	
4	Check that line side conductors are SDI and < 500mm		( )	
	Current Transformers			
6	Correct ratio & size		( )	
7	Correct direction of feed		( )	
8	Correct earthing		( )	
9	Correct cabling		( )	
	Voltage / Current Monitoring Equipment			
10	Correct voltage / current range on meter to the installation		( )	
11	Correct to ratio on Cts		( )	
12	Voltmeter terminations are insulated		( )	
13	Check that all meters are preset to zero		( )	
14	Correct indication labels applied		( )	
	Indication Equipment			
15	Correct colour		( )	
16	Correct voltage size with matching lamp attached		( )	
17	Correct operation eg. Push to test		( )	
18	Correct labelling		( )	
	Terminal Blocks			
19	Correct size to cable		(✓)	GB
20	Correct colour coding		(✓)	GB
21	Correct numbering		(–)	–
22	Correctly mounted with lock ends		(✓)	GB
23	Correct labels		(✓)	GB
	Neutral Links			
24	Check that they are accessible		(✓)	GB
25	Correct labelling		(✓)	GB
26	Correct numbers stamped to match circuit identification		(✓)	GB
27	Correct cabling to circuit identification		(✓)	GB
28	Check that all neutral links & bar are insulated from the switchboard frame		(✓)	GB
	Earthing			
29	Check that all main earth bar is correct size		(✓)	GB
30	Check that the main earth is continuous		(✓)	GB
31	Correctly labelled		(✓)	GB
32	Continuous for CT wiring		(–)	–
33	Check that all doors with equipment mount are electrically earth		(✓)	GB
34	Check all frames are earthed		(✓)	GB

Remarks/Remedial Action Required:

Remedial Actions Completed ☐ **Signature:** ..... Date:

Approved By: GLENN BACON	
Signature: Glenn Bacon	**Checked By:** Laurent Bouiller
Electrical Licence No. 113407	**Signature:** **Date:**

All the above signatories certify that the Electrical switchboard work listed has been checked and tested in accordance with the prescribed procedure and that such work complies in every respect with the requirements of the Electricity Act 2002, AS3000 2007 and AS3008.1 1998

Inspection and Test Check List

Switch Board and Control Panels Construction Check List (SJQF 502)				
Item	**Activity Description**	**Hold Points**	**Test Result**	**By (Initial)**
	Earthing Resistance & Continuity Test (Note all readings should be < .5 ohms) Make sure the MEN connection is removed and attach lead to main earth connection point than test with other lead between			
1	The frame of each section		<0·1 Ω	GB
2	The doors		<0·1 Ω	GB
3	All mounting bolts to all equipment		<0·1 Ω	GB
4	All brackets		<0·1 Ω	GB
5	All earth links		<0·1 Ω	GB
6	All bolts & threads for the mounting of escutcheon		— Ω	—
7	All gland plates		Ω	
8	All cable trays		— Ω	—
9	All earth connection		<0·1 Ω	GB
10	Earth secondary of transformers and power supplies		<0·1 Ω	GB
11	Earth surge diverters		<0·1 Ω	GB
12	Current transformers		— Ω	—
	Insulation Test	**Hold Points**	**Test Result**	**By (Initial)**
1	Make sure all control fuses and earths are removed from all electronic equipment before this test is carried out and Set insulation tester (meggar) to 500 volts before proceeding			
	• Red - White		— Ω	—
	• Red - Blue		— Ω	—
	• Red - Earth		>200 MΩ	GB
	• Red - Neutral		>200 MΩ	GB
	• White - Blue		— Ω	—
	• White - Earth		— Ω	—
	• White - Neutral		— Ω	—
	• Blue - Earth		— Ω	—
	• Blue - Neutral		— Ω	—
2	If all readings are clear the insulation tester is to be set at 1000 volts then proceed with the following			
	• Red - White		Ω	—
	• Red - Blue		Ω	—
	• White - Blue		Ω	—

Remarks/Remedial Action Required:

Remedial Actions Completed ☐ **Signature:** ..... Date:

Approved By: GLENN BACON	
Signature: Glenn Bacon	**Checked By:** Laurent Pasquier
Electrical Licence No. 113407	**Signature:** **Date:**

All the above signatories certify that the Electrical switchboard work listed has been checked and tested in accordance with the prescribed procedure and that such work complies in every respect with the requirements of the Electricity Act 2002, AS3000 2007 and AS3008.1 1998

Inspection and Test Check List

Switch Board and Control Panels Construction Check List (SJQF 502)				
Item	**Activity Description**	**Hold Points**	**Checked**	**By (Initial)**
	2.5 KV Test This test is used to prove all busbar construction			
1	Make sure all control fuses and earths are removed from all electronic equipment before this test is carried out		( )	
2	All the following tests must be set at a 1 minute time period, result should be 0 Amps		( )	
		Hold Points	**Test Result**	**By (Initial)**
3	Test between: • Red - White			
	• Red - Blue			
	• Red - Earth			
	• Red - Neutral			
	• White - Blue			
	• White - Earth			
	• White - Neutral			
	• Blue -Earth			
	• Blue - Neutral			
	Supply Authority section			
1	Check supply authority main isolator lockable in the on position		( )	
2	Check all doors before the Ct's. Or meters are lockable		( )	
3	Check where the neutral link is located for the site connection if metres are remotely mounted		( )	
4	Check where the earth link is located for the site connection if meters are remotely mounted		( )	
5	Check double insulated cable for POT fuses are less than 500 mm		( )	
6	Check double insulated cable are taken on line side of Ct.s		( )	
7	Check metre wiring is in building wire and correct size		( )	
8	Check if Ct meter wiring is in steel conduit when closer than 100mm to other conductors		( )	
9	Check there is no equipment connected before on the line side of meters or Ct.s (i.e., surge diverters)		( )	
10	Check list may vary if switch board is going interstate. Alter where applicable		( )	

Remarks/Remedial Action Required:

Remedial Actions Completed ☐ **Signature:** ..... Date:

Approved By: GWENN BACON		
Signature: Gwen Bacon	**Checked By:** Laurent Pavalle	
Electrical Licence No. 113407	**Signature:**	**Date:**

All the above signatories certify that the Electrical switchboard work listed has been checked and tested in accordance with the prescribed procedure and that such work complies in every respect with the requirements of the Electricity Act 2002, AS3000 2007 and AS3008.1 1998

Inspection and Test Check List

Switch Board and Control Panels Construction Check List (SJQF 502)				
Item	**Activity Description**	**Hold Points**	**Checked**	**By (Initial)**
	Functional Test			
Prior to connection of supply all inspection and test check lists must be completed		**Hold Points**	**Checked**	**By (Initial)**
1	Point to point test on all cables as per schematic and single line drgs. (Leave spot for drawing. No's and Rev No's		(✓)	GB
2	Check all Cts are not open circuit		(–)	–
Connect supply (personal protection equipment must be used)		**Hold Points**	**Test Result**	**By (Initial)**
3	Check polarity of connection • Red - White		V	
	• Red - Blue		V	
	• Red - Earth		V	
	• Red - Neutral		V	
	• White - Blue		V	
	• White - Earth		V	
	• White - Neutral		V	
	• Blue -Earth		V	
	• Blue - Neutral		V	
		Hold Points	**Checked**	**By (Initial)**
4	Correct voltage / ~~current~~ range on meter to the installation		(✓)	GB
5	Check functional operation of switchboard following specific construction issue drawings (leave spot for drawing No's and Rev No's		(–)	–
6	Check operation of all RCD's < .03s		(–)	–
	Pre delivery check list		( )	
1	Check all punch list items are complete		(–)	N/A
2	Check if Compliance label is mounted and correct		(–)	N/A
3	Check if heat shrinks is supplied when necessary		(–)	N/A
4	Check all load bolts are supplied		(–)	N/A
5	Check if m.e.n is mounted after testing		(–)	N/A
6	All drawings have been as built red lined and supplied to drafting office		(✓)	GB
7	Photos have been taken of every section and given to manager		(✓)	GB
8	Test reports have been photo copied and placed in the client folder and SJ Electric folder		(–)	–
9	As built drawings received back from drafting office , verify Rev No.		(–)	–
10	Manuals placed in client folder		(–)	–
11	Switch Board wrapped with delivery details supplied		(✓)	GB
12	As built drawings placed in client folder. (Latest revision (–)	Copy of red lined marked Drawing (–)		

Remarks/Remedial Action Required:

Remedial Actions Completed ☐ **Signature:** ..... **Date:**

Approved By: GLENN BACON	
Signature: Glenn Bacon	**Checked By:** Laurent Paraller
Electrical Licence No. 113407	**Signature:** **Date:**

All the above signatories certify that the Electrical switchboard work listed has been checked and tested in accordance with the prescribed procedure and that such work complies in every respect with the requirements of the Electricity Act 2002, AS3000 2007 and AS3008.1 1998

5. Compliance Certificates

SJ ELECTRIC QUEENSLAND

A Division of the Trivantage Group

19 Elliot Street, Albion QLD 4010
P 07 3256 1522 F 07 3256 1533
E mail@sjelectric.com.au ABN 22 573 962 619 REC 7623
www.trivantage.com.au

Ref: Test Certificate PRV154

TEST CERTIFICATE

SJ Electric (Qld) Pty. Ltd.
19 Elliot Street.
Albion Qld. 4010
R.E.C. 7623

Attention: Mr Glenn Rolfe

Contracts Manager
Major Projects and Commercial Services

Queensland Urban Utilities
GPO Box 13277
George Street,
Brisbane Qld 4003

Work performed for Queensland Urban Utilities at PRV154 Corner of Cordelia Street and Montague Road South Brisbane under contract BW: 70103-06/07 Order No 60 (SJ Electric Job Number 43400306)

Installation Tested / Equipment Tested

- Solar Powered Supply Switchboard
- Pole with Solar Panel
- QUU free issued PRV switchboard
- New Main earth
- Conduits etc

All supporting test sheets attached.

Test Date
19/4/2012

For the electrical installation, this certificate certifies that the electrical installation to the extent it is affected by the electrical work has been tested to ensure it is electrically safe and is in accordance with the requirements of the wiring rules and the electrical safety regulation 2002. C.J. Holmes (endorsee to electrical contracting license 73286)

For the electrical equipment, this certificate certifies that the electrical equipment, to the extent it is affected by the electrical work, is electrically safe. C.J. Holmes (endorsee to electrical contracting license 73286)

Signed