CyDen

Work Instruction

WORK INSTRUCTION TITLE:

High Voltage Awareness Training

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Function: Electronic / Software Design Manger

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Document History

Rev.	Comments
00	Initial release

Purpose

This work instruction provides training on High Voltage and Mains Voltage Awareness

Required Reading

Prior to undertaking this training the following reports must be read and understood:

- *CTR-1913 - Slash Electric Shock Severity Assessment*
- *CTR-1933 - Slash Working Voltage Assessment*

Scope

This instruction details the minimum awareness required for engineering staff.

Equipment Required

List the equipment here	

Introduction

The generation of IPL Energy necessarily requires the use of "high voltage". The definition of high voltage for the purpose of this training and risk assessment is any voltage above SELV levels, rather than the common definition of >1500VAC. This definition includes the main storage capacitor voltage at 290V, the Anode Boost voltage at 900V and the Trigger voltage at -8Kv.

Reducing the opportunity to shock: When opening the device

Both the Slash and Glow devices store a potentially harmful voltage in an energy storage capacitor that will retain the voltage even when disconnected from the power supply. This voltage will exist for up to an hour after disconnection.
When disassembling the devices care must be taken to ensure conductive tools or body parts do not come into contact with the stored voltage. Medical versions of the devices have all of the hazardous area marked, but earlier version may not.
Once disassembled the hazard must be eliminated by manually discharging the capacitors using the discharge tool. This must be placed across the storage capacitor in the correct polarity and held for 20 seconds after the LED has extinguished to ensure full discharge. This will have eliminated the source of harm to the engineer but other capacitors may remain changed to various voltage levels that could damage sensitive electronic components. These can only be considered on a design by design basis and if in doubt the technical team lead should be consulted.

Reducing the opportunity to shock: When working on an open device

Wherever possible the operation of a device should be tested within its enclosure thus providing electrical safety. Where this is not possible the upmost care should be taken to reduce the risk of an unexpected electric shock. The following care points should be adhered to as a minimum:

- Remove all liquids from the immediate area
- Work on an insulating material – PTFE sheet (remember that ESD mats are conductive)
- Clean and clear the work area – remove any loose conductors
- Secure the high voltage source – Tape to desk along with any trailing wires that could be caught and pulled
- Isolate / Insulate and mark up hazards where possible.

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Mains Voltage Training

Conventionally CyDen developed products use externally designed and pre-approved power supplies, these provide an adequate safety isolation barrier from Mains Voltage. Where the isolation characteristics have not been proven *(e.g. prototype PSU)* then an external isolating transformer must be used to ensure the engineers safety when working on the device.
Under the unusual requirement to work on the mains side of a power supply further specific training and/or experience is required and additional safety measures must be taken *(e.g. Local RCD, floating / isolated tools).*

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Training Review: I200032 High Voltage Awareness Training

What tool is required when safely disassembling any CyDen IPL device?

Discharge Tool

Do you have, or have access to the correct tool?

Yes

Who should be consulted for any design specific care points when opening a device?

Technical Team Lead

Detail 4 care points that should be adhered to when working on an open device?

No Liquids to be in the working area, Clean station of any conductors

Work on insulating Material

Secure Source and Tape Down Any Leads

Isolate and insulate any hazard areas and mark with warnings where possable

What device must be used to ensure safety if an unproved external PSU is used?

External Isolating Transformer

Do you have or have access to the correct device?

Yes

Are you suitably trained to work on the Mains side of a power supply?

NO

Trainee Jonathan Watson

Assessor

Date 11/10/2019

Training Pass / Fail