Weaver
CONSTRUCTION MANAGEMENT
3679 S Huron Street, Suite 404 Englewood, Colorado 80110
Phone: (303) 789-4111 FAX: (303) 789-4310

SUBMITTAL TRANSMITAL

April 27, 2012
Submittal No: 11210-001.A

PROJECT: **Harold Thompson Regional WRF**
Birdsall Rd.
Fountain, CO 80817
Job No. 2908

ENGINEER: **GMS, Inc.**
611 No. Weber St., #300
Colorado Springs, CO 80903
719-475-2935 Roger Sams

OWNER: **Lower Fountain Metropolitan Sewage Disposal District**
901 S. Santa Fe Ave.
Fountain, CO 80817
719-382-5303 James Heckman

CONTRACTOR: **Ozonia North America**
600 Willow Tree Road
Leonia, NJ 07605
201-676-2525

SUBJECT: UV Disinfection System Resubmittal – Response to Comments dated 3/12/12 & 4/20/12 and Shop Submittal Revision A

SPEC SECTION: 11210

PREVIOUS SUBMISSION DATES: 1/10/12

DEVIATIONS FROM SPEC: ___ YES _X_ NO

CONTRACTOR'S STAMP: This submittal has been reviewed by Weaver Construction Management and, unless indicated otherwise, has been found to be in conformance with the intent of the contract documents.

Contractor's Stamp:	Engineer's Stamp:
Date: 4/27/12 Reviewed by: John Jacob (X) Reviewed Without Comments ( ) Reviewed With Comments	

ENGINEER'S COMMENTS:_____
_____

O

Ozonia North America
600 Willow Tree Road
Leonia, NJ 07605
Tel: 201-676-2525
Fax: 201-346-5460

TRANSMISSION OF DOCUMENTS

To:	Weaver Construction Management 3679 S. Huron Street, Suite 404 Englewood, CO 80110	**Date:**	**April 25, 2012**
		Project:	**Harold Thompson WRF**
		Job No:	**18-253**
Attn:	John Jacob	**Location:**	**Fountain, CO**

From: **Doc. No.:**

ID	Title & Description	# Pgs	Qty.	Code
1	Responses to Submittal Comments dated 3/12/12	**5**	Elec.	D
2	Responses to Submittal Comments dated 4/20/12	**4**	Elec.	D
3	UV System Shop Drawing Submittal, Revision A Harold D Thompson WRF	**243**	Elec.	D
4				
5				
6				
7				
8				
9				

Comments:

Responses to GMS, Inc. Submittal Comments dated 3/12/12 and 4/20/12

UV System Shop Drawing Submittal, Revision A

Transmitted electronically via Extranet Fileshare on 04/25/12

Please confirm, in the box provided below, the reception of the above documents and return a copy of the signed transmittal form to Ozonia.

Code:	A: For Information	C: For Construction	E: For Installation
	B: Preliminary	D: For Approval	F: Final Issue

Sent by: **Received by:** **Date:**

James Nekus

Date: Thursday, April 12, 2012

To: John Jacob, Weaver Construction

From: James Nekus, Ozonia North America

Subject: Responses to Weaver Construction Submittal Comments dated 3/12/12

Below are responses in **RED** font to your recent submittal comments:

1. The comments contained in this letter constitute a partial review of the above referenced submittal. Additional comments will be provided in the near future. Meanwhile, please address all items described below and begin the re-submittal process.

   OZONIA: Submittals are corrected please see Revision A.

2. In the Descriptive Summary, page 2 of 3, a 6-inch square wireway has been included with the UV disinfection equipment. The submitted wireway is proposed to be surface-mounted to the floor slab to route power and data cables to the UV modules. In order to avoid any floor obstructions, the project drawings illustrate a design layout in which all power and data cables are routed in the utility chase between the UV channels (below the finish floor level). Therefore, the submitted 6-inch square wireway will not be required.
   Please provide a summary of the cost - reduction that can be provided to the Owner.

   OZONIA: Wireway is removed from the Rev. A submittals. Ozonia recommends that the cables remain installed within the wireway and rigid conduit both to and from the wireway or completely within rigid conduit if the wireway is deleted. If the cable is not installed within wireway and rigid conduit, Ozonia will not be responsible for any warranty or damages associated with the power and data cables including, but not limited to, overheating and moisture. Please note that if the overall length of the wireway is a concern, it can be offered in 5 ft. or 8 ft. lengths.

   If the wireway is still not requested by the Owner in light of the information noted above, the credit to remove the wireway from Ozonia's scope of work is $1000.00.

3. In the Descriptive Summary, page 2 of 3, the level control weir trough submitted is not acceptable due primarily to its length. Refer to subsequent comments in this letter for additional information.

   OZONIA: Corrected in the Rev. A submittals. Please see response to comment #5 for additional details.

4. Page 2 of 4 of the Installation Instructions include the description for the wireway submitted. As mentioned earlier, the wireway is not required. Please revise this comment to address the appropriate installation steps regarding the power and data cables utilizing the utility chase shown on the Project Drawings.

   OZONIA: Wire detail and references are updated in corrected submittal.

Ozonia North America LLC
600 Willow Tree Rd. | Leonia | NJ 07605 | USA
Tel : +1 201 676 2525 | Fax : +1 201 346 5460 | www.ozonia.com

5. In Section 1, Subsection No. 8, Clarifications to Contract Specifications, a single item is given describing the level control weir trough. This single item references Project Drawing PD-4 and then describes the weir design to be for a projected future peak flow of 9.26 mgd. As stated in earlier comments, the submitted weir trough is too long for the flume channel in which it is to be installed. At the submitted length, the weir trough has a high potential to adversely affect the flow through the effluent flume, resulting in inaccurate effluent flow measurements. The size and location of the level control weir shall be in accordance with Project Drawings PD- 11 and PD-13, both of which have been attached to this preliminary review letter for convenience. As for designing the level control weir for flows greater than the Phase 1 peak hour flow of 4.625 mgd, the hydraulic capacity of the weir can be maximized to the extent permissible by the physical size and location requirements given on the attached Project Drawings.

OZONIA: Revised level control weir is included in submittal Rev. A

An adder is required to change the level control weirs to both fit within the flume channel shown in Project Drawings PD-11 and PD-13 and maintain the weir design appropriate for the maximum future flow from two channels (9.26 MGD). Project Drawings PD-11 and PD-13 were not included as part of the base bid and therefore necessitate the change to Ozonia's scope. The cost to increase the design from two(2) long level control weir troughs to one(1) large serpentine level control weir sized for 9.26 MGD and to fit within the flume channel is $9,664.00

6. The following items pertain to the drawing System Plan Layout, Sheet 1 of 4, in submittal Section 2:

   a. The level control weir trough shown on this drawing shall be revised according to previous comments in this letter.

      OZONIA: See comment response #5 above

   b. The floor-mounted wireway assembly shown shall be deleted in accordance with previous comments in this letter. The routing of the power and data cables for the UV modules and the low level float switch shall be surface-mounted in conduit from PDDC-1 to the west side of the UV cleaning tank. From there, the conductors shall drop just below the cleaning tank grating and then continue south through the utility chase between the UV channels. The conductors continuing to each individual UV module will be routed through the portals of the utility chase to UV Channel No. 1 for connection to the UV modules.

      The utility chase has been designed to be below finished floor elevation with a diamond plate cover. With this design, the utility chase will not be submerged, but it does have the potential to accumulate moisture. Please verify whether the power and data cables are rated for wet environments and can therefore be installed within the utility chase without conduit, or the cables are not wet environment rated and will require conduit within the utility chase.

      OZONIA: Cables connected to the module are moisture resistant, but are not designed to be submersible. If the wireway is removed from Ozonia's scope and cables are not installed within rigid conduit, Ozonia will not be responsible for any warranty or

damages associated with the power and data cables including, but not limited to, overheating and moisture. Ozonia recommends that the cables remain installed within the wireway and rigid conduit both to and from the wireway.

c. The low level switch is shown on this drawing as being located upstream of Slide Gate SG-20 (UV Channel No. 1 downstream isolation slide gate). Please verify whether or not it is possible to mount this level switch further downstream next to the cleaning tank as shown on Project Drawing PD-11.

OZONIA: The purpose of the level switch is to assure the minimum water level required to the modules, so it must be located close to the critical minimum level of the modules, not isolated by a slide gate, please see the location in the layout 18253-77-0201.

d. Please revise the tag numbers given to the UV modules. The north module shall be UV Module 1A, with the south module being UV Module 1B.

OZONIA: The tag numbers for the UV modules will need to remain 1& 2 due to Ozonia's programming standards and conventions. Changing the tag numbers of the modules would constitute a major change to the Ozonia programming, as it would impact countless tags and attributes.

e. The position of the UV modules within UV Channel No. 1 appears to be too far south as the power and data connections are not lined up with the utility chase portals. As there is no scale to this drawing, we ask that the final position of these UV modules be verified. Refer to subsequent comments for Sheet 2 of 4.

OZONIA: In order to have optimum disinfection, it is required to have a minimum distance of 5 ft between the module 1 and the slide gate, so the location of the portals must be adjusted accordingly.

f. The tag number to be used for the power distribution and data center by Ozonia shall be PDDC-1.

OZONIA: Corrected in the Rev. A submittals.

g. The tag number to be used for the step-down transformer by Ozonia shall be UVXFM-1

OZONIA: Corrected in the Rev. A submittals.

7. The following items pertain to the drawing Sections and Details Assembly, Sheet 2 of 4, in submittal Section 2:

a. Remove the wireway assembly shown and reroute the power and data cables to the utility chase.

OZONIA: Corrected in the Rev. A submittals.

b. If the low level float switch can be relocated as described in previous comments for Sheet 1 of 4, please revise its location and notes on this drawing as well.

OZONIA: Please see response 6c.

c. The drawing indicates a 2-inch grating overlap of the north and south eye shields. As the entire channel is to receive aluminum grating across the top, it is assumed this grating overlap is associated with the fabricated end of grating panels. Please confirm that Ozonia does not intend for the channel above the UV modules to be without grating panels. If Ozonia does concur that the entire UV channel can be covered with grating panels, WCMI must coordinate the given 2-inch grating overlap with its grating fabricator to ensure proper grating panel dimensions are fabricated.

OZONIA: Corrected in layout, the modules can be completely covered with grating.

d. A 5'-0" dimension is given on this drawing which appears to represent a distance of UV Module 1A to the end of the UV channel. However, the end of the channel is not shown correctly on this drawing. Please verify the intent of the 5'-0" dimension and revise Section A-A of the submitted drawing to correctly reflect the end of channel location.

OZONIA: 5 ft minimum is required as noted in a response above to comment 6.e.

e. Please revise the UV module tags as described for Sheet 1 of 4.

OZONIA: Corrected in the Rev. A submittals.

8. The following items pertain to the drawing Sections and Details Assembly, Sheet 3 of 4, in submittal Section 2:

a. Please revise Section B-B and Detail "E" to delete the wireway assembly and reroute the power and data cables to the utility chase.

OZONIA: Corrected in the Rev. A submittals.

b. Please revise the level control weir troughs shown in Section B-B. Note the top of weir elevation given on the Project Drawings is 5401.50. Please confirm this elevation is acceptable for the equipment to be provided.

OZONIA: It is acceptable and corrected accordingly.

c. Please indicate the tag of PDDC-1 for the power distribution and data center shown in Section B-B.

OZONIA: Corrected in the Rev. A submittals.

9. The following items pertain to the drawing Sections-Weir Troughs, Sheet 4 of 4, in submittal Section 2:

   a. Please revise the plan and sections shown on this drawing for the level control weir troughs, referring to comments in this letter and the attached Project Drawings PD-11 and PD-13. The top of weir elevation should be 5401.50 as indicated on the Project Drawings.

      OZONIA: Corrected. See responses #5 and #8.b above for additional details

Please do not hesitate to contact me if you have any questions.

For OZONIA NORTH AMERICA

James Nekus, PMP
Project Manager

CC: Mark Morton, GMS, Inc.

Ozonia North America LLC
600 Willow Tree Rd. | Leonia | NJ 07605 | USA
Tel : +1 201 676 2525 | Fax : +1 201 346 5460 | www.ozonia.com

THIS PAGE IS INTENTIONALLY LEFT BLANK

Date: Wednesday, April 25, 2012

To: John Jacob, Weaver Construction

From: James Nekus, Ozonia North America

Subject: Responses to Weaver Construction Submittal Comments dated 4/20/12

Below are responses in **RED** font to your recent submittal comments:

1. The comments contained in this letter are our remaining comments following the partial review comments previously issued to WCMI. In compiling the resubmittal package for the ultraviolet (UV) radiation disinfection system, please ensure that all comments contained in this letter and the previous partial review letter are encountered for.

   OZONIA: Noted

2. To follow up on the previous review comments regarding the modification to the submitted level control weir trough, this matter has been discussed with James Nekus with Ozonia North America and John Jacob with WCMI. Following those discussions, it is recommended the serpentine, or accordion, weir be provided for level control on this project. The serpentine weir will provide a larger hydraulic capacity and, therefore, greater operational flexibility. Also, the serpentine weir installation is simplified compared to the trough weir installation as it will eliminate the additional concrete work required within the flume channel by the trough weir configuration. Please modify the submittal documents to include the use of the serpentine weir on this project.

   OZONIA: OZONIA: Revised level control weir is included in submittal Rev. A

   An adder is required to change the level control weirs to both fit within the flume channel shown in Project Drawings PD-11 and PD-13 and maintain the weir design appropriate for the maximum future flow from two channels (9.26 MGD). Project Drawings PD-11 and PD-13 were not included as part of the base bid and therefore necessitate the change to Ozonia's scope. The cost to increase the design from two(2) long level control weir troughs to one(1) large serpentine level control weir sized for 9.26 MGD and to fit within the flume channel is $9,664.00

3. The following items pertain to Section B of the submittal:

   a. In Subsection 1, revise Paragraph 3.5.1. on Sheet 8 of 27 of the Preliminary O&M Instructions to reference and describe the serpentine level control weir to be provided on this project.

      OZONIA: Corrected in submittal Rev. A. See comment #2 above for additional details.

Ozonia North America LLC
600 Willow Tree Rd. | Leonia | NJ 07605 | USA
Tel : +1 201 676 2525 | Fax : +1 201 346 5460 | www.ozonia.com

b. In Subsection 5, Drawing No. 18253-77-0056 - Sheet 1 of 2, Note 3. requests the contractor to verify the required data cable length. Please do so according to the routing indicated on the Project Drawings, i.e., use of the utility chase between the UV channels rather than the floor-mounted wireway proposed in this equipment submittal.

OZONIA: Corrected in submittal Rev. A. Contractor to advise that data cable length shown in the submittals is acceptable prior to Ozonia beginning fabrication.

Ozonia recommends that the cables remain installed within the wireway and rigid conduit both to and from the wireway or completely within rigid conduit if the wireway is deleted. If the cable is not installed within wireway and rigid conduit, Ozonia will not be responsible for any warranty or damages associated with the power and data cables including, but not limited to, overheating and moisture.

c. In Subsection 5, Drawing No. 18253-77-0056 - Sheet 2 of 2, Note 3. requests the contractor to verify the required power cable length. Please do so according to the routing indicated on the project Drawings, i.e., use of the utility chase between the UV channels rather than the floor-mounted wireway proposed in this equipment submittal.

OZONIA: Corrected in submittal Rev. A. See comment #3.b above for additional details.

4. The following items pertain to Section C of this submittal:

a. In Subsection 3, Drawing No. 18253-77-0050 - Sheet 2 of 3, a field-installed cable run is indicated for connection between the PDDC and the facility's SCADA system. It appears this cable should be a standard Category 5 ethernet cable, please verify. In addition, please provide a complete list of UV disinfection system information (data, setpoints, statuses, alarms, etc.) available for communication to the facility's SCADA system. This should include any data mapping information required for the system integrator to coordinate the exchange of data between the UV equipment PLC and the facility's SCADA system.

OZONIA: Yes, standard Cat5 communication cable is to be used.

Database in the form of MS Excel spread sheet to be provided in a subsequent submittal after approval of shop drawings.

b. In Subsection 5, Nameplate Lists, verify the location intended for nameplate INP and include the tag number PDDC-1 for proper equipment identification.

OZONIA: Intended location of name plate 1NP is top center of PDDC-1.
Drawing 18253-02-0200 sheet 1 of 2 was revised.
Intended location of name plate 2NP is inside electrical cabinet PDDC-1.
Drawing 18253-02-0200 sheet 2 of 2 was revised.
Nameplate list (List Of Nameplates) was revised to include "PDDC-1".

c. In Subsection 5, Drawing No. 18253-02-0225, it is requested a 80A circuit breaker be provided on the 480V power feeder to the UV equipment. From the submitted transformer data sheets it appears the primary side line current is less than 35A. If that is true, then the requested 80A circuit breaker seems oversized. Please verify the 80A circuit breaker is truly required and the justification for its sizing.

OZONIA: Circuit breaker rating calculation performed per NEC article 450.3, table 450.3(B): Transformer primary current. 32.5A * 2.5 = 81.28A. Full load of transformer secondary is not needed. Eighty(80) amp circuit breaker is fine for use in this application.

5. The following items pertain to Section N of this submittal:

a. In Subsection 2, Sheet 1 of 1 of the Accessory and Special Equipment List, delete Item No. 7, the floor-mounted wireway. Please note, a summary of the cost reduction for this deletion shall be provided for the Owner.

OZONIA: Wireway is removed from the Rev. A submittals. Ozonia recommends that the cables remain installed within the wireway and rigid conduit both to and from the wireway (as shown in Ozonia drawings) or completely within rigid conduit if the wireway is deleted. If the cable is not installed within wireway and rigid conduit, Ozonia will not be responsible for any warranty or damages associated with the power and data cables including, but not limited to, overheating and moisture. Please note that if the overall length of the wireway is a concern, it can be offered in 5 ft. or 8 ft. lengths.

If the wireway is not required in light of the information noted above, the credit to remove the wireway from Ozonia's scope of work is $1000.00.

b. In Subsection 2, Sheet 1 of 1 of the Accessory and Special Equipment List, modify Item No. 8 to provide the serpentine weir level control device in lieu of the trough weir originally submitted.

OZONIA: Corrected in submittal Rev. A. See comment #2 above for additional details.

c. In Subsection 2, delete Drawing No. 18253-1 1-0501 for the floor-mounted wireway.

OZONIA: Corrected in submittal Rev. A. See comment #5.a above for additional details.

d. In Subsection 2, revise Drawing No. 18253-11-0601 to detail the serpentine weir level control device in lieu of the submitted trough weir.

OZONIA: Corrected in submittal Rev. A. See comment #2 above for additional details.

e. In Subsection 3, Drawing X0063, the length of cable required for the level switch has not been indicated. WCMI shall verify the length required utilizing the utility chase routing indicated on the Project Drawings. In addition, the submittal documents indicate the use of one (1) level switch for a low channel water level indication. Please verify the proposed Ozonia equipment does not require a high channel water level switch as well.

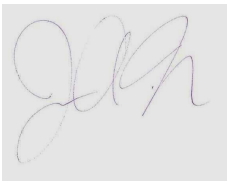
OZONIA: Float cable length is shown in dwg. X0063. Ozonia confirms that the equipment does not require high level switch, due to the oversize fixed level control weir.

f. In Subsection 4, Sheet 1 of 1 of the System Power Supply Materials List, Item No. 1 is shown as a step-down transformer rated at 51 kVA. All other submittal documents indicate a 27 kVA transformer. Please revise accordingly.

OZONIA: Corrected in submittal Rev. A

Please do not hesitate to contact me if you have any questions.

For OZONIA NORTH AMERICA



James Nekus, PMP
Project Manager

CC: Mark Morton, GMS, Inc.

Ozonia North America LLC
600 Willow Tree Rd. | Leonia | NJ 07605 | USA
Tel : +1 201 676 2525 | Fax : +1 201 346 5460 | www.ozonia.com

OZONIA NORTH AMERICA, LLC
600 WILLOW TREE ROAD
LEONIA, NJ 07605 USA
TEL 201 676-2525 | FAX 201 346-5460

UV SYSTEM SUBMITTAL DOCUMENTATION

Harold D. Thompson Regional Water Reclamation Facility

Fountain, CO

Ozonia North America
Contract Number – 18253

Revision A

Volume 1 of 1

Date of Submittal: April, 2012

4/12/2012

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

DESCRIPTIVE SUMMARY

Aquaray® 40 HO VLS

The Aquaray® 40 HO VLS UV disinfection system, for the Harold D. Thompson Water Reclamation Facility at Fountain, CO includes but is not limited to the following:

1. AQUARAY® 40 HIGH OUTPUT VERTICAL LAMP MODULES:

Quantity - 2

Each module is completely assembled, including UV lamps and mechanical wipers, ready for installation by the Contractor. Installation involves simply lowering the UV modules into the UV contact channel between the module mounting rail/eye protection plates and making two connections; power and data. Module materials of construction will be 316 stainless steel.

2. UV INTENSITY SENSORS:

Quantity - 2

These will be delivered boxed and need to be connected to each module by the Contractor. One end simply attaches to the stainless steel deflector adjacent to a lamp in the array via a threaded connection. The other end screws into a connector on the underside of the module enclosure.

3. MODULE MOUNTING RAILS/EYE PROTECTION PLATES:

Quantity - 3

These are bolted into the channel(s) between each Aquaray® module by the Contractor using drill-in-place anchor bolts, 4 per mounting rail. Anchor bolts will be provided.

4. POWER INTERCONNECT CABLES:

Quantity - 2 total for the system

Power Interconnect Cables will be provided in between the PDDC and the UV modules in each channel. Field termination and interconnection will be the Contractor's responsibility.

Each power cable consists of three (3) 6-gauge conductors with lengths cut to size for each module location and PDDC numbered terminals. Maximum cable length is 75.0 ft.

CHECKED:	TITLE:	SHT:
LC 3/30/12	Descriptive Summary **Harold D. Thompson Water Reclamation Facility – Fountain, CO**	1 of 3
APPROVED: JN	OZONIA NORTH AMERICA 600 Willow Tree Road Leonia, NJ 07605	DWG No. 18253-77-0035 / REV: A

5. DATA INTERCONNECT CABLES:

Quantity - 2 total for the system

Data Interconnect Cables will be provided in between the Power Distribution and Data Center (PDDC) and the UV modules in each channel. Maximum cable length is 75.0 ft.

6. POWER DISTRIBUTION CENTER (PDDC):

Quantity - 1

The PDDC will be fully assembled, but will need to be anchored into position by the Contractor and terminations made as described herein. Power requirement of 230V/3ph/60Hz to PDDC panel is be provided via a stepdown transformer.

The PDDC includes the UV control system, which is an Allen Bradley SLC5/05 controller with Panelview 1000 color touch screen display. The Contractor, as described herein, shall make terminations and interconnections between the wireway and the PDDC.

7. STEPDOWN TRANSFORMERS :

Quantity - 1

One (1) 27 KVA Stepdown transformer (460Delta-230Y/133VAC/3ph/60Hz) will be provided by Ozonia for installation by the contractor.

8. LEVEL CONTROL SERPENTINE WEIR:

Quantity – 1

One (1) 304 S.S. Set of fixed serpentine weir will be provided by Ozonia for installation and supports by the contractor.

9. LEVEL SENSOR SWITCH:

Quantity - 1

A Low Level sensor switch will be provided by Ozonia for installation by the contractor.

10. CLEANING SYSTEM:

Quantity - 1

One (1) cleaning system exerciser to drive the wiping system.

11. FIELD SERVICE:

The services of a fully qualified Service Engineer will be provided for pre-installation inspection, start-up, and operator training.

- Total number days field service to be provided – 5 maximum
- Number of trips – 2 maximum

CHECKED:	TITLE:		SHT:
LC 3/30/12	Descriptive Summary **Harold D. Thompson Water Reclamation Facility – Fountain, CO**		2 of 3
APPROVED: JN	OZONIA NORTH AMERICA 600 Willow Tree Road Leonia, NJ 07605	DWG No. 18253-77-0035	REV: A

12. **ONA will supply the following spare parts and safety equipment. Refer to the spare parts list 18253-64-0100. All spare parts and safety equipment will be separately packaged. All packages will be clearly labeled with quantity, item description, and part number. Because these components are fragile, the installing contractor should take immediate steps to store the parts safely before they are handed over to the end user.**

13. **The head loss through UV channel at peak flow is 1.47 inches. With the objective to keep, the module submerged between the minimum of 57.5 inches and maximum of 62 inches under the water.**

14. **Any items not specifically listed in this Descriptive Summary and those noted in the following are to be provided by others:**

    - Piping, Channel Drains, Valves and Isolation gates
    - Walkway Grating
    - 4-20 mA Plant Flow Signals
    - Installation of equipment
    - Cable conduit between the PDDC and the wireway
    - Pulling of Cables (Power and Data) from the modules thru the wireway and into the PDDC Terminations
    - Lifting Crane with hoist and trolley
    - On-site performance testing including collection, transport and laboratory analysis of effluent samples.

CHECKED:	TITLE:	SHT:
LC 3/30/12	Descriptive Summary **Harold D. Thompson Water Reclamation Facility – Fountain, CO**	3 of 3
APPROVED:		DWG No. / REV:
JN	OZONIA NORTH AMERICA 600 Willow Tree Road Leonia, NJ 07605	18253-77-0035 / A

Exhibit B

OZONIA

PERFORMANCE PROCESS GUARANTEE Rev November 16, 2011

SCOPE AND TIME LIMITATIONS. ONA guarantees the process results specified below for a period *of two (2) years from (a)substantial completion, or (b)December 31, 2012; whichever occurs first,* only if the Products are operated properly under conditions, loads and parameters as stated below.

NOTICE REQUIREMENT AND REMEDY. ONA shall, upon receipt of written notice within thirty (30) days of any breach of or failure under this guarantee, determine whether ONA is responsible for the Product's failure to fulfill this Performance Process Guarantee. If it is determined by ONA that ONA is responsible, ONA shall make every reasonable effort to correct the failure by adjusting or altering the Products or specific part of the Products to which the failure is attributable or by providing new or additional Products or parts of the Products at its expense.

11-17-11

~~INDEMNITY. If it is determined for any reason that ONA is not responsible for any breach of or failure under this guarantee, Owner shall pay ONA for all costs incurred by ONA in investigating and substantiating Product process conformance with this Performance Process Guarantee.~~

EXCLUSIONS. If any changes occur in load or composition of the material being treated, if the Products are not stored, installed, maintained and correctly operated in accordance with ONA's written instructions and requirements; or if the Products are subjected to misuse, neglect, corrosion, or accident, this Performance Process Guarantee shall be null and void.

LIMITATION OF LIABILITY. ONA's total liability, including costs incurred or expended by ONA in attempting to correct all process deficiencies, shall not, under any circumstances, exceed in the aggregate the total Purchase Price under this contract or, if such failure is attributable to only a specific part or item of the Products provided hereunder, the value of the specific part or item that has failed to meet guaranteed process results. Under no circumstances shall ONA be liable for any special, incidental, indirect, statutory, exemplary, punitive or consequential damages, of any kind whatsoever, or for any lost profits, business or revenue, loss of use or goodwill, or other lost economic advantage, arising out of or related to or arising from ONA's obligations under this Performance Process Guarantee, whether such claims are based on breach of contract, breach of warranty, strict liability, tort, any federal or state statutory claim, or any other legal theory and even if ONA knew, should have known, or has been advised of the possibility of such damages. THE REMEDIES PROVIDED HEREIN ARE EXCLUSIVE, AND ONA SHALL INCUR NO LIABILITY IN ADDITION TO THAT STATED HEREIN. The limitation specified in this section shall survive and apply even if any limited remedy specified in the Contract is determined to have failed of its essential purpose. In no circumstance will any liability under any portion of this Contract or associated contracts exceed the total Purchase Price. In the event that more than one claim is substantiated, the aggregate amount of all claims combined will not exceed the total Purchase Price.

The UV disinfection system shall:

Reduce the E-Coli count in the plant effluent to less than 65.4 counts/100 mL (30 day geometric mean) based on peak flow with all modules in service. The process performance guarantee is based upon the following influent conditions.

Peak Flow	-	4.63 MGD
UV Transmission	-	65% minimum
TSS	-	30 mg/l (30 day average)
Particle Size	-	30 micron maximum

Made in USA

Exhibit A

OZONIA

OZONIA NORTH AMERICA, LLC
600 WILLOW TREE ROAD
LEONIA, NJ 07605 USA
TEL 201 676-2525 | FAX 201 346-5460

WARRANTY *Revised November 16, 2011*
AQUARAY @ 40 HO ULTRAVIOLET DISINFECTION SYSTEM

Ozonia warrants the products shall conform to the description contained in this Contract and be free from defects in material and workmanship for a period of *two (2) years from (a) the date of substantial completion, or (b) December 31, 2012; whichever occurs first,* provided that the Products are stored, installed, maintained and operated in accordance with OZONIA's written instructions and not subjected to misuse, neglect or accident.

Upon prompt written notice of and determination that such defect is covered under the foregoing warranty, OZONIA's responsibility is limited to correction of the defect by, at OZONIA's option, repair or replacement of the defective part or parts, f.o.b. factory. The foregoing warranties are exclusive and in lieu of all other warranties of any kind, including any implied warranty of merchantability or fitness for a particular purpose.

The extended equipment Guarantee applies to the following items:

UV Lamps:

- At 13,000 hours of operation, the average UV lamp output will be no less than 90% of a new lamp (after 100 hours initial burn-in.).
- The UV lamp shall produce UV light with at least 90% of the UV emission at 253.7 nm wavelength.
- The UV lamps will be warranted for 13,000 hours of useful life and the warranty is to be pro-rated against actual lamp use after 1,000 hours of operation up to 13,000 hours.

Ballasts & Quartz Sleeves

- The guaranteed life of the ballast and quartz sleeves is 5 years each, Any ballast or quartz sleeves that would fail within the guaranteed period shall be replaced at no cost to the owner. OZONIA's responsibility is limited to correction of the defect by, at OZONIA's option, repair or replacement of the defective part or parts, f.o.b. factory.

UV Intensity Sensor

- The guaranteed life of the UV intensity sensor is 5 years and any sensor that would fail within the guaranteed period shall be replaced at no cost to the owner provided that the system is operated and calibrated in accordance with OZONIA's O&M Instructions Manual. OZONIA's responsibility is limited to correction of the defect by, at OZONIA's option, repair or replacement of the defective part or parts, f.o.b. factory.

- End -

PERFORMANCE TEST PROTOCOL

FOR SECONDARY EFFLUENT APPLICATIONS

Aquaray® 40 HO VLS

1.0 PREPARATION FOR TESTING

The performance testing should be conducted once commissioning and startup of the UV disinfection system are fully completed. The lamps should be burnt-in (100 hours) and the UV disinfection system free of alarms. Performance testing can only take place with all the equipment upstream of the UV disinfection system fully operational and functioning normally. Before testing is initiated the channel and fixed weirs should be cleaned of all debris, the floor and walls scrubbed with commercial bleach.

2.0 TEST PROCEDURE

During testing the UV disinfection system should operate automatically in dose pacing mode. Mechanical cleaning of the module sleeves should also proceed automatically at the proper frequency. Prior to sampling it should be verified that the number of lamp rows in service as a function of measured UV transmittance and instant flow rate is (1) correct and (2) stable to ensure that the target dose is met while testing.

A total of 6 sampling events will be conducted over a 3-day period as follows: Two sampling events per day. Sampling events will be spaced by a minimum of 2 hours. An alternate sampling schedule may be selected based on project specific requirements. However, space the sampling events by at minimum 1 hour.

The samples will be collected and preserved in accordance with sections 9060 A and 9060 B of the Standard Methods for the Examination of Water and Wastewater (20^{th} edition). Sampling containers should be initially sterilized in accordance with sections 9030 and 9040. Sampling should be grabbed only (no sampling pump). Avoid contacting the walls or floor of the channels and fixed weirs when collecting samples. Avoid sampling in a stagnant area of the channel where contaminants (foam, oil, etc) have built-up at the water surface. The temperature of the sample should be kept below $4^{o}C$ during a maximum transport period of 6 hours. Samples should be refrigerated upon receipt in the laboratory and processed within 2 hours.

Chain of custody procedures should be followed using a custody form acceptable to all parties. The laboratory shall provide all sample containers required for sample collection.

Sample collection shall be delayed a minimum of 30 minutes following the completion of an in-channel air scour cycle. During testing, any alarm condition (e.g. lamp failure, low UV intensity, etc.) should be logged and addressed immediately. Once an alarm condition has been resolved a minimum of 30 minutes should elapse prior to re-starting the performance testing protocol. If the channel being monitored shuts down during testing or if it is turned on just before performance testing begins sampling should be delayed by at least 30 minutes following lamp ignition.

There are 2 sample points:

(1) Influent sample to be collected upstream of the first module

(2) Effluent sample to be collected immediately downstream of the last module in the channel.

3.0 SAMPLE ANALYSIS

Sample analysis is to be conducted at an independent, State certified testing laboratory as selected by the Consulting Engineer. Measurement of fecal coliform concentrations should be conducted by the multiple-tube fermentation procedure (MPN) in accordance with section 9221 E of the Standard Methods or membrane filtration procedure (CFU) per section 9222 D. Both procedures are included in the US EPA 40 CFR Part 136

guidelines. Measurement of Enterococci concentrations should be conducted in accordance with the US EPA membrane filtration method 1600 (CFU) or using a test kit such as Enterolert™ Quantitray from IDEXX or equivalent for enumeration (MPN). Alternate indicator microorganisms can be selected for the performance test. Careful review of the microbiological analytical method should be exercised in this case. Selection of a specific procedure should be based on the project effluent limit requirement and whether the microbial count is expressed in terms of MPN/100 mL or CFU/100 mL.

Samples submitted for microbial analysis should also be tested for the following parameters.

- UV Transmittance at 253.7 nm
- Filtered UV Transmittance at 253.7 nm
- Total Suspended Solids

In addition, the following data should be collected on the first influent sample of the day for each test day

- Biological Oxygen Demand (BOD5) or Chemical Oxygen Demand (COD) in mg/L
- Turbidity in NTU
- Total Dissolved Solids or conductivity in (umhos/mL)
- pH at time of sampling
- Water temperature at time of sampling
- Calcium hardness in mg/L of $CaCO_3$
- Total iron in mg/L

4.0 REPORTING REQUIREMENTS

The following items should be logged at the time of sampling for each sampling event.

- Date and time
- Flow through the UV disinfection system
- Sample location
- UV intensity readings in mW/cm^2 as displayed on the HMI
- Number of lamp rows in operation
- Time of sample collection (if different from above)
- Influent Microbial Count
- Effluent Microbial Count
- Influent/Effluent non-filtered and filtered UV Transmittance as indicated in Section 3.0
- Influent/Effluent Total Suspended Solids (TSS) as indicated in Section 3.0
- On-line UV transmittance if present
- On-line turbidity if present
- Operational UV Dose in mJ/cm^2 or $mW.sec/cm^2$ as displayed on the HMI
- All alarm conditions displayed
- Lamp rows hours and number of on/off cycles as displayed at the HMI (See specific log sheet)

Finally, the laboratory should document the time of analysis for all samples.

AQUARAY® 40 VLS UV DISINFECTION SYSTEM
INSTALLATION INSTRUCTIONS

1.0 SAFETY

! WARNING

THE FOLLOWING IMPORTANT SAFETY PRECAUTIONS MUST BE FOLLOWED WHEN WORKING WITH ULTRAVIOLET DISINFECTION SYSTEMS:

Ultraviolet light at the 253.7 nm wavelength can severely damage eyes and skin if proper safety precautions are not taken. Even very brief exposure to the eyes will cause *arc eye* which is extremely uncomfortable and, if repeated, will cause permanent damage.

Always ensure that all supplied eye shields and warning signs are installed with the Aquaray® 40 UV Disinfection System.

The most effective approach is to simply avoid exposure to UV rays. Routine operation and maintenance of the UV disinfection system can be accomplished without exposure to UV rays, however, it is good practice to wear the supplied UV safety goggles when servicing or inspecting the equipment while it is operating.

If exposure to the UV rays cannot be avoided, then exposure must be limited to no longer than a few minutes and the following precautions must be taken:

1.1 WEAR APPROVED SAFETY GOGGLES

The proper goggles are supplied with the equipment and can be identified by the letters "UV" imprinted in the corner of the lens. The goggles must fit tightly to the face.

1.2 WEAR FACE SHIELD OVER GOGGLES

The face shield is used for the facial skin protection only and must not be used as eye protection.

1.3 PROTECTIVE CLOTHING

The use of fully buttoned long sleeved shirt, long pants, and gloves are required to protect skin. Always check for openings where skin can be exposed to UV rays. The neck, exposed through an unbuttoned shirt, is a common spot of burn.

2.0 INSTALLATION - CONTRACTOR'S RESPONSIBILITIES

The Aquaray® 40 UV Disinfection System consists of many different components. Ensure that all components are inspected for damages and compared with the packing list. All damages and shortages must be reported to ONA immediately. All damages, whether visible or concealed, must be noted on the Bill of Lading and reported to the delivering carrier.

All items must be installed as shown on the system and component drawings. All deviations must be reported to ONA for approval. Carefully study all bills of material and associated note sheets for specific instructions.

The following list outlines the components which are to be installed by the contractor BEFORE the ONA service engineer comes to the site for startup.

Control panel (PDDC or PDC/DCC) AND ELECTRICAL INSTALLATION

The panel(s) must be installed as indicated on the associated drawings in Section A of the O&M Manual. Each panel must be securely anchored to a smooth and level concrete pad or floor. Each panel must be shimmed or grouted level and plumb. If the panel is wall mounted, verify that the panel is level and securely anchored to the wall.

All fittings and attachments must meet *NEMA 4X* as well as *NEC* and all applicable local codes.

The power connections must be installed as indicated on the electrical documents provided. POWER MUST NOT BE APPLIED TO ANY PANEL UNTIL THE INSTALLATION HAS BEEN INSPECTED AND APPROVED BY AN ONA ENGINEER.

Interconnect Harnesses (Power and Data Cables): All cables must be routed to the proper locations and terminated per drawings. All interconnecting wires and cables must be protected from damage and weather during all phases of installation.

Power Supply: The power supply must be connected and available before the ONA service engineer arrives.

The power and data cables must be installed in separated rigid conduit lines according current local and national electric codes adjacent to the channel as shown on the ONA layout drawings.

2.2 MODULE MOUNTING RAILS (EYESHIELDS)

The module mounting rails (also called eyeshields) are metal plates which are installed between adjacent module banks, to block the UV light and register the location of adjacent module banks. The mounting rails must be installed square and level per the contract drawings. The specified tolerances must be maintained to prevent binding of the modules during installation and removal. The installation details on the drawings show the location of the mounting rails and the mounting bolts so that sufficient clearance is provided for the modules.

2.3 INSPECT ALL MODULES FOR BREAKAGE

The Aquaray® 40 UV Modules are shipped fully assembled, and contain quartz tubes and UV lamps. The UV modules must be carefully inspected for damage and returned to the crates for storage until start-up. The UV modules must not be installed in the channel until the modules and the channel have been inspected by an ONA engineer.

MODULES SHOULD BE KEPT IN THE CRATES FOR PROTECTION UNTIL THE ONA SERVICE ENGINEER ARRIVES.

2.4 EFFLUENT FLOW

Ideally, plant flow should be available when the startup engineer arrives. Alternately, a temporary source of water can be supplied.

2.5 PERIPHERAL EQUIPMENT (FLOW METERS, GATES) INSTALLED?

The flow signal, lifting device, flow control gates, etc, should be installed and ready to be operated when the service engineer arrives. The lifting device must be checked to ensure that there is sufficient clearance to lift the modules over any obstacles (cleaning tanks, wireways, conduits, etc).

2.6 4-20 MA FLOW SIGNAL AVAILABLE

The flow signal should be landed in the ONA control panel, flowmeter shall be operational, and calibration values should be noted so that the ONA service engineer can calibrate the control equipment.

2.7 CHANNEL DIMENSIONS AND CONDITION

The channel must be carefully inspected against the contract drawings for clearances and alignment. All tolerances must be maintained (i.e.: channel width +½" - 0) and floor and walls must be level and plumb. Channel walls and floor must be smooth and clean.

One UV module may be used temporarily to test each position for proper clearances. The module must not be left in the channel at any time while construction is in progress. The channel must be cleaned of dust and debris prior to final inspection and startup.

2.8 LEVEL CONTROL

The Effluent Level Control must be installed at the precise location and elevation as indicated on the contract drawings. The level control must be made water-tight with gaskets, caulking, or non-shrink grout.

Flap gate type level controls must be installed plumb and level. The sealing surface of the gate must make contact around the full perimeter. Adjust as necessary prior to caulking or grout. Adjustment of the counter balance will be done at start-up under the supervision of an ONA engineer.

Other level control devices should be installed as per ONA contract drawings.

3.0 STARTUP OUTLINE

The following list outlines tasks carried out by the ONA service engineer during startup. The ONA startup engineer will not necessarily perform these tasks in the order listed; the specific startup plan is based on site conditions.

THESE TASKS ARE TO BE PERFORMED BY OR UNDER THE SUPERVISION OF THE ONA SERVICE ENGINEER.

- Inspect channel for proper layout, including:
- Eyeshields (elevation and spacing)
- Module location relative to inlet and outlet structures
- Wireway (location and nameplates)
- Conduit/cabling (ensure power and data cables pulled to correct locations and that conduit is sized per the drawings)
- Inspect wiring at control panel to ensure conformity with contract drawings. Verify flowmeter setpoints.
- Inspect air piping and verify blower operation (if applicable)
- Inspect modules for damage before installation. Note any damage (results from shipping or storage?)
- Install modules in channel, inspecting for proper fit as modules are placed in channel. Ensure that channels are built to correct size and tolerance. Modules should fit into channel without binding. Ensure that channel is flushed clean before installing modules.
- Turn on all modules manually from the controller and check for alarm conditions (lamps, communication failure, etc) Correct any alarm conditions.
- Test controller in automatic and manual mode. Verify that any remote monitoring equipment is terminated in the panel properly and is operational (annunciator panel, SCADA, etc).
- Verify the calibration of all auxiliary instruments such as level sensors, flow meters, UVT analyzers, etc. These devices generally provide a 4-20 mA signal to the controller. Ensure that the incoming signal matches the displayed readings on the controller.
- Verify that spare parts are on hand as specified. Have a list of all spare parts on hand signed by the contractor or plant personnel; send the list in with service report.
- Perform training. Training outline should follow the format of the O&M manual to ensure that all topics are covered. Have all personnel present in training class sign a sheet indicating that they have been trained, send the list in with service report.

AQUARAY® 40 VLS UV DISINFECTION SYSTEM
LONG TERM STORAGE INSTRUCTIONS

The equipment should be visually inspected upon receipt and any apparent damage (broken quartz jackets or lamps) must be reported to ONA immediately. If equipment storage is required, then the UV equipment must be protected from damage. The equipment must be stored indoors in a dry location free from any dirt and debris. Construction traffic in this area should be kept at a minimum.

All of the equipment should be kept in the original shipping crates. The modules must be stored in an upright position. Do not allow the shipping crates to fall over. Severe damage will result.

Be advised that the quartz jackets and UV lamps are factory installed in the modules before shipment. Take extreme care when handling the crates as not to damage the fragile components. Desiccant bags are factory installed in each module and PDDC panel and should be replaced after 6 months.

If the system has already been started up and will be stored or shut down for any period of time, the panel should be powered up and the heater should remain on, this is to prevent condensation in the panel. The modules should remain powered up and desiccant bags should be placed in each module and the control panel to avoid condensation buildup. Alternately, the modules can be stored indoors and out of the weather.

ONA WILL NOT BE RESPONSIBLE FOR ANY DAMAGE
DUE TO IMPROPER STORAGE AND/OR HANDLING.

CHECK: MDL 03/28/06	TITLE: AQUARAY® 40 VLS STORAGE INSTRUCTIONS			SHT: 1 of 1
APPROVED: WA	OZONIA NORTH AMERICA 600 WILLOWTREE RD LEONIA, NJ 07605	A	DWG No. 18000-77-0055	REV: -

Ondeo Degremont, Inc.
Richmond, Virginia

FINAL REPORT

ULTRAVIOLET DOSE BIOASSAY OF THE ONDEO DEGREMONT AQUARAY HO10 VERTICAL LAMP DISINFECTION SYSTEM

November 2001

Project No: IDIC0020

Environmental
Engineers & Scientists

TABLE OF CONTENTS

Section **Page**

APPENDICES

LIST OF FIGURES

LIST OF TABLES

ULTRAVIOLET DOSE BIOASSAY OF THE ONDEO DEGREMONT HO10 VERTICAL LAMP DISINFECTION SYSTEM

An assay and related testing were conducted by HydroQual, Inc., on an ultraviolet disinfection system manufactured by Ondeo Degremont, Inc. (ODI), Richmond, Virginia. The equipment consisted of two 10-lamp modules in series, with the lamps in each assembled vertically in a staggered 2 x 5 array. All work was conducted at the Rockland County Sewer District No. 1 WWTP in Orangeburg, New York.

The objective of the bioassay was to develop a relationship between delivered UV dose and flow rate through a scaleable UV test reactor. Dose is defined as the product of UV intensity (I) and exposure time (t), or It. Intensity cannot be measured directly in a multilamp reactor, and time is, in fact, a distribution of residence times within the system, related to the degree of mixing. As such, it is difficult to estimate dose by separate evaluation of these two variables. As an alternative, the bioassay protocol uses an approach that implicitly estimates the delivered dose. In this method, a culture of bacteriophage is subjected to varying UV doses in a laboratory apparatus that allows direct and accurate measurement of time and intensity, yielding a dose-response calibration of the organisms. The culture is then injected into the test unit under specific operating conditions. The bacteriophage response is measured, from which a delivered dose estimate can be implied.

The bioassays were conducted with potable water. The UV transmittance (at 253.7 nm) of the water was adjusted to 58 percent. This represents a combined simulation of a wastewater transmittance of 65% and a 20% reduction in UV output equivalent to end-of-lamp-life operating conditions. Hydraulic tracer tests were also conducted to define the residence time distribution of the unit and its conformity with plug flow conditions that are required for disinfection.

MATERIALS AND METHODS

The following discussions present the procedures and materials that were used to conduct the bioassay and hydraulic tests on the Ondeo Degremont vertical lamp system. Specifically, these address the culturing and calibration of the bacteriophage, assembly and operation of the test unit, assay of the test unit with the calibrated bacteriophage, and hydraulic characterization of the test unit.

F-Specific RNA Bacteriophage Preparation

The organism that was used to assay the test unit was a F-specific RNA bacteriophage, a bacterial virus that can infect a specific host strain with F- or sex-pili, producing clear areas, or plaques

within a confluent lawn of grown host strain. It has a relatively high tolerance to UV light and exhibits dose requirements that are typically higher than required by most bacterial organisms. This allows development of a dose-response relationship that encompasses dose levels required for most wastewater disinfection applications. Additionally, the response of the bacteriophage is fairly consistent over repeated applications.

The methodology for detection and enumeration of F-specific RNA bacteriophage was in accordance with ISO DIS 10705-1 (Havelaar): Water Quality - Detection and Enumeration of Bacteriophages. The host strain was *Escherichia coli (E. coli)* ATCC 23631. The bacteriophage stock was developed by HydroQual, Inc., grown to a density from 2 to 4 x 10^{11} pfp/mL.

Dose-Response Calibration

Dose is the product of the intensity of radiation and the time to which an organism is exposed to the radiation. Intensity can not be measured directly in a complex lamp unit because the light surrounds a receiving particle and commercial detectors are planar. Additionally, the exposure time in a system is, in fact, a distribution of times due to some degree of mixing in the unit. Thus, the bioassay relies on first calibrating the assay organism in the laboratory by defining its response to a given dose. The dose is measurable in this case because the radiation is collimated (unidirectional) and the test is run in a batch, completely mixed mode, such that time is measurable as discrete intervals of exposure.

A dose-response relationship was developed for the bacteriophage using a laboratory-scale collimated beam apparatus. The unit utilized a G64T5L germicidal lamp as the UV source. The lamp is enclosed in a non-reflective, air-cooled sleeve. The exposed portion of the lamp (approximately 10 cm) was suspended above a 30-cm long, 10-cm diameter non-reflective collimating tube. A petri dish containing sufficient sample to give a liquid depth of 1 cm (79 mL) was placed approximately 2.3 cm below the bottom of the collimator.

Prior to exposure, the intensity of the ultraviolet radiation was adjusted to 200 μWatts/cm^2 at the surface of the sample. Intensity was measured with an IL1700 Radiometer using a SED-240 Detector with a W Quartz wide-eye diffuser and a NS254 filter. The detector was last calibrated by International Light, Inc., of Newburyport, Massachusetts in November 2000. A copy of the calibration certificate can be found in Appendix A.

The stock bacteriophage aliquot was diluted with the same source water that was used for the assays. The water was first dechlorinated and phage were then added to yield a density between 1 and 2 x 10^5 pfp/mL. The sample was stirred gently and continuously during exposure using an insulated

magnetic mixer with a micro-spinbar. After exposure, samples were plated immediately. The plates were incubated at 37°C for 16 to 20 hours, after which the number of plaque forming units were counted.

Dose-response runs were conducted throughout the test period. Four to five exposures times were used per run, ranging between 100 and 500 seconds and equivalent to dose levels between 20 and 100 mW-sec/cm^2. Control (no exposure) and exposed samples were sampled in triplicate, and two dilutions of each were plated in triplicate. Two control samples, with one sample representing time zero, were normally run for each dose run. Intensity was mapped at 20 locations over the plane of exposure. The intensity was also checked at each of the control exposure periods to verify that no variation in intensity occurred within a given run.

Test Unit

A 20 ft (6.1 m) long, stainless steel open-channel, 1 ft (0.30 m) wide, provided by Ondeo Degremont, Inc. was used for the test unit. A stilling plate was inserted into the upstream section of the channel, approximately 42 in (1.1 m) ahead of the lamp battery to break the energy of the inlet pipe. A adjustable rectangular weir was installed at the end of the channel (approximately 5 ft (1.5 m) downstream of the lamp battery). A stilling plate was inserted about 42 in (1.1 m) downstream of the second lamp bank and prior to the weir. The channel width in the disinfection zone was 7.25 in (18.4 cm).

Two UV disinfection modules were mounted in series in the channel. The lamp configuration for each module is shown schematically in Figure 1. The system utilized a staggered lamp array configuration, with the lamps placed vertically in the channel, perpendicular to the direction of flow, and on centerline spacings of 2.8 in (7.1 cm) across the width of the module and 5 in (12.7 cm) along the length of the module. The test unit had a total of 20 lamps.

The high-intensity, low-pressure, germicidal lamps have a rated UV output of 52 watts (W) UV, and a total power draw of 165W. The lamps have a nominal length of 60 in (155 cm) and an effective arc length of 58 in (147 cm). The quartz sleeves were a test-tube type, with one sealed end, and an outer diameter of 1 inch (2.45 cm). The lamps were first "burned-in" for a minimum of 100 hours before testing. The lamps were driven by 10 electronic ballasts, each controlling 2 lamps. The ballasts were located inside a control box mounted on top of each lamp module. The nominal voltage to the system 230 VAC.

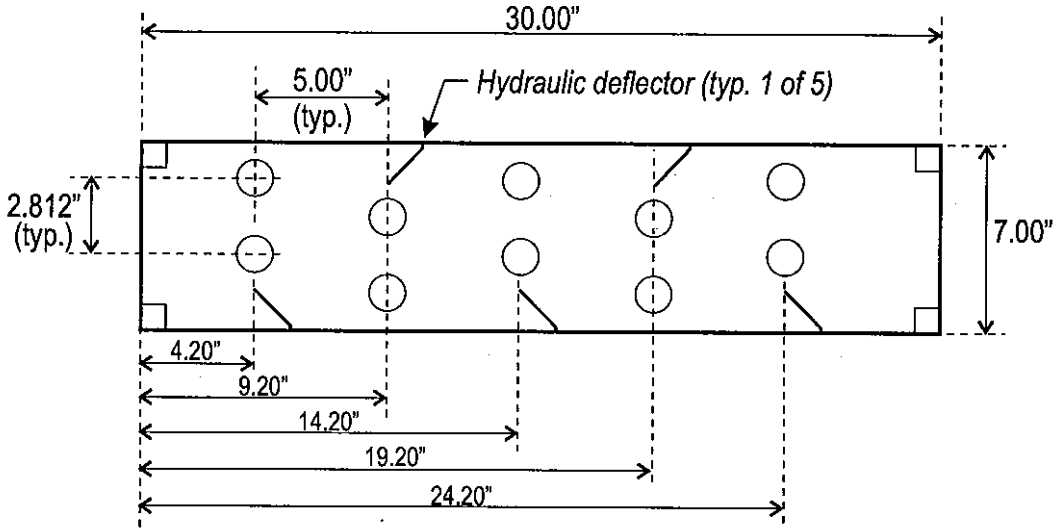


Figure 1. Lamp Module Schematic.

Test Unit Installation

Figure 2 is a schematic of the field test installation at the Rockland County Sewer District No. 1 Plant in Orangeburg, New York. A local potable water hydrant was used as the source of water for testing. A batch stock solution consisting of coffee (to alter transmittance), sodium thiosulfate (to ensure removal of residual chlorine) and bacteriophage was prepared in a large rectangular steel tank. The mixture was fed to the unit via a diesel-powered centrifugal pump. Water flow rates to the unit were set and measured by a Bailey-Fischer & Porter magnetic flow meter, Model 10D1465P-NS, which was installed on the influent line to the UV reactor.

The flow meter calibration was checked by comparing the flow readings from the in-line meter to flows implied from velocity measurements in the channel over the range of treated flows. These were within 5% of the direct meter readings. In all testing, the meter flows were used for reporting operating conditions.

Bioassay Analysis

A component of the bioassay protocol was to simulate end of lamp life conditions during testing. For this bioassay, a value equal to 80% of the nominal UV output of the lamp was simulated; where the nominal UV output represents the UV output at normal operating conditions (voltage, amperage, etc.) after approximately 100 hours burn-in. The commercial (and pilot) system's lamp-ballast configuration is not designed to allow direct electrical manipulation to reduce lamp output. As such, an alternate approach to simulate end-of-life conditions was developed. Using HydroQual's main-frame version of The Ultraviolet Light Intensity Program or TULIP, the Aquaray system configuration was modeled and a relationship of theoretical average intensity versus percent transmittance (at 254 nm) was developed. The numerical values of theoretical average intensity as a function of water transmittance is shown for both the full-scale 40HO module and the 10HO test module on Table 1. Figure 3 presents these relationships graphically.

Using a baseline condition of 65% transmittance at 100% output, the theoretical nominal intensity corresponding to a 20% reduction in lamp output for the test unit was computed. This intensity is equivalent to a test condition transmittance of 58% (at 100% lamp output). This method conforms to the protocols for setting the minimum UV sensor level to conduct similar bioassay testing in NWRI/AWWARF Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse (National Water Research Institute, NWRI-00-03, Fountain Valley, CA, December 2000).

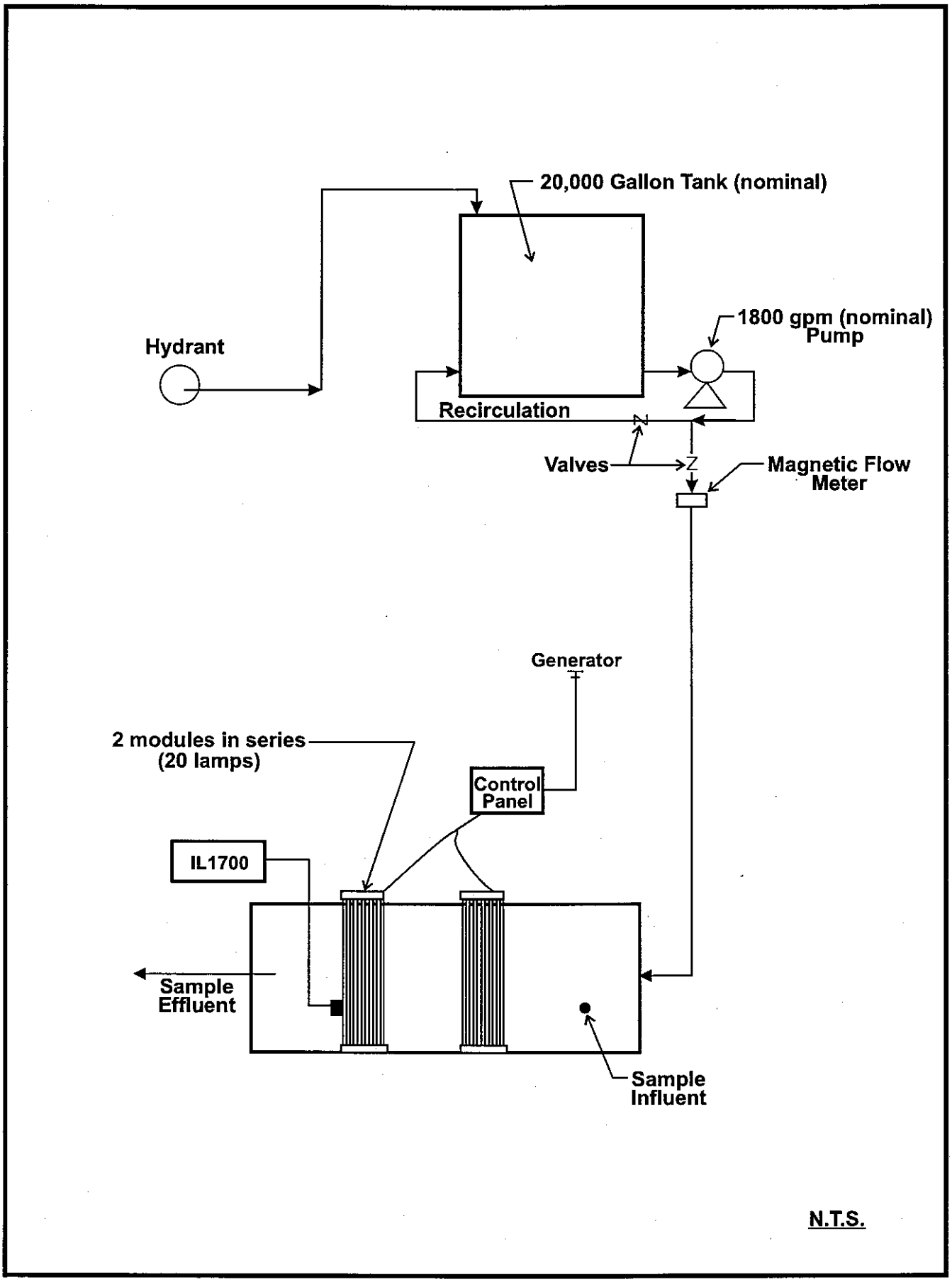


Figure 2. Schematic of the Test Installation for the ODI Disinfection System.

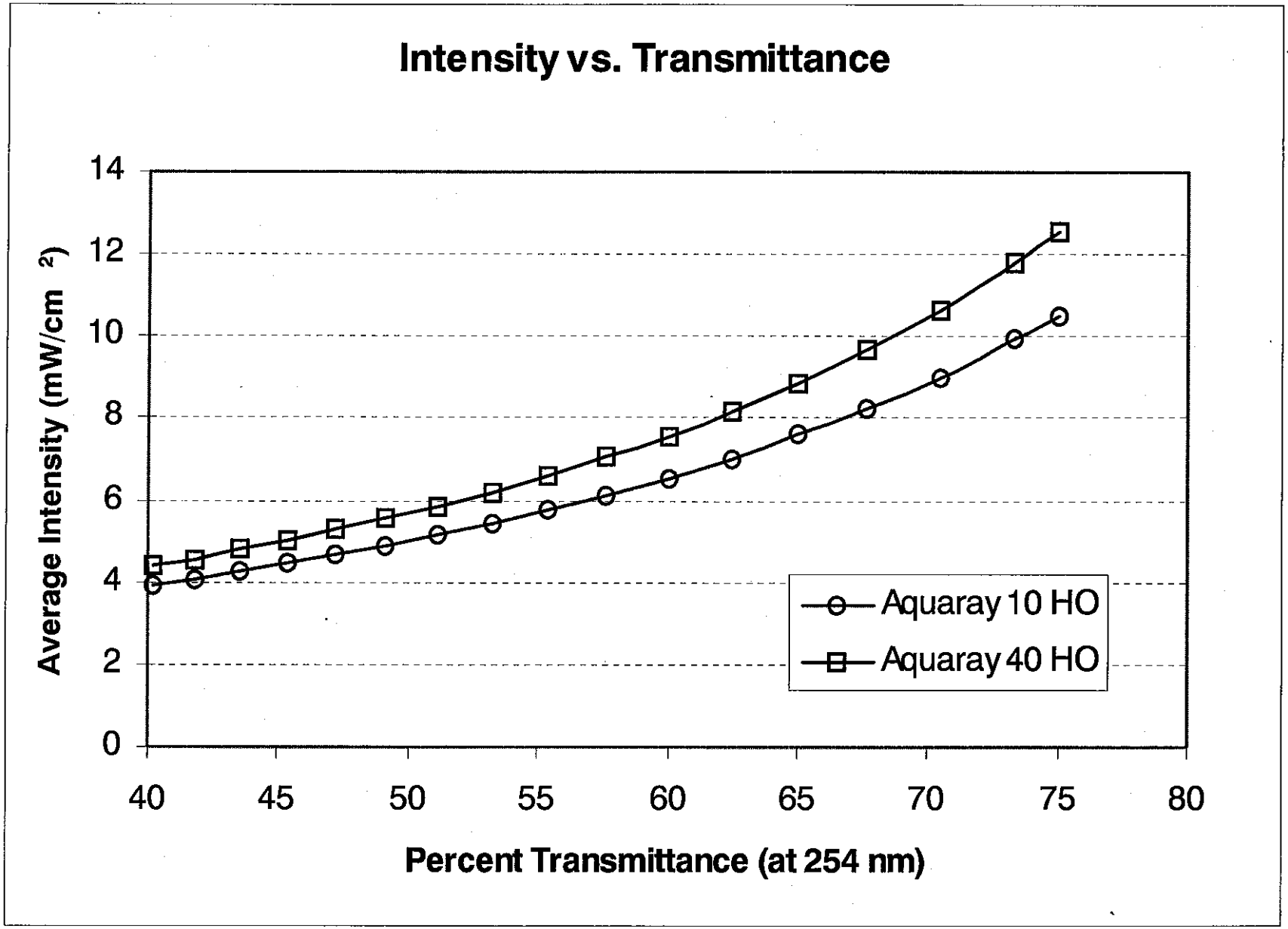


Figure 3. Intensity vs Percent Transmittance for ODI Aquaray 10HO and Aquaray 40HO

Table 1. Relationship of Theoretical Nominal Intensity vs. Water Transmittance and Absorbency at 254 nm

Transmittance (%)	Absorbance Coefficient (a.u./cm)	Aquaray 10HO Average Intensity (mW/cm^2)	Aquaray 40HO Average Intensity (mW/cm^2)
75.0	0.29	10.5	12.5
73.3	0.31	9.94	11.8
70.4	0.35	9.01	10.5
67.7	0.39	8.24	9.65
65.0	0.43	7.59	8.83
62.5	0.47	7.03	8.14
60.0	0.51	6.55	7.55
57.7	0.55	6.13	7.04
55.4	0.59	5.76	6.59
53.2	0.63	5.44	6.20
51.1	0.67	5.15	5.85
49.1	0.71	4.89	5.53
47.2	0.75	4.65	5.26
45.3	0.79	4.44	5.00
43.6	0.83	4.25	4.78
41.9	0.87	4.08	4.56
40.2	0.91	3.91	4.37

Flow rates of 200, 400, 600, 800 and 1000 gpm [757, 1514, 2271, 3028 and 3785 Lpm], were tested in quadruplicate:

1. Potable water from a hydrant was first fed directly to the test unit at a rate of approximately 200 gpm (760 Lpm). The UV system was turned on and allowed to operate for at least one and one-half hour prior to testing to ensure stable output from the lamps. This was verified by monitoring the intensity within the bank of lamps with the IL1700 detector located in a fixed position facing upstream into the lamp battery. The voltage was maintained 230 VAC, the nominal operating voltage for the system.

2. During the lamp stabilization period, a 20,000 gal (76,000-liter) batch of test water was prepared. A rectangular tank was filled with potable water from a hydrant. Instant coffee was added during fill-up to adjust the transmittance of the test water to 58 ±2% percent at 253.7 nm. Sodium thiosulfate was also added to remove any residual chlorine in the test water. The contents of the tank were continually mixed via recirculation through a 1800 gpm (7800 Lpm) pump. The bacteriophage suspension was added to the tank to yield a density of approximately 10^5 to 10^6 pfp/mL. The full tank was then mixed for at least 30 minutes.

3. Flow from the hydrant to the test unit was stopped and flow from the tank was initiated. A desired flow rate was set and monitored via the magnetic flow meter until a stable reading was obtained.

4. The system was operated under these conditions for a time interval sufficient to accomplish a minimum of five volume changes in the UV reactor before sampling, thereby ensuring steady-state conditions.

5. Samples were taken in triplicate at each flow setting before and after (post-weir) the lamp banks.

6. Once sampling was completed, the flow rate was adjusted to the next target flow rate.

This sequence was repeated for each batch run. Samples were returned to HydroQual's laboratory for analysis. Two dilutions of each sample were plated in triplicate. These were incubated at 37°C for 16 to 20 hours; plaques were then counted to estimate bacteriophage densities in the influent and effluent for each test run. UV transmittance at 253.7 nm was measured for each sample using a Shimadzu (Model UV-1201S) UV/Vis spectrophotometer. The calibration was checked in February 2001. A copy of the calibration report can be found in Appendix A.

Hydraulic Testing

Residence time distributions were developed at five test flow conditions (757-3785 Lpm). Protocols are established for the step-response method in the USEPA Design Manual for Municipal Wastewater Disinfection (EPA/625/1-86-921, 1986). The procedure is summarized as follows:

1. A concentrated coffee solution was continuously injected at a constant rate into the upstream end of the lamp bank. This injection point was positioned at mid-depth, approximately 3 in (8 cm) in front of the lamp battery.

2. A UV detector (IL SUD240, International Light) was mounted outside the second lamp rack, approximately 3 in (8 cm) from the down-stream end. UV intensity was monitored using an IL 1700 radiometer.

3. Coffee injection was continued until a new "steady-state" UV intensity was reached (from background).

4. The coffee solution was shut-off and the return of UV intensity to background conditions was traced on a chart recorder.

5. Chart recordings were digitized and used to develop residence time distribution curves.

RESULTS

Dose-Response Calibration

Data for each of the dose-response runs are presented in Appendix B, Tables B1 through B-4. Table 2 presents a summary of these data. Note that dose is calculated by the following expression:

$$D = I_o t\left[\left(1 - e^{-kd}\right) / kd\right] \quad (1)$$

Where:

D = UV Dose at 253.7 nm (mW-s/cm^2)
t = Exposure time (seconds)
I_0 = Incident Intensity at the surface of the sample (mW/cm^2)
k = Absorbance coefficient (cm^{-1}, base e)
d = Depth of the sample (cm)

TABLE 2 SUMMARY OF MS-2 COLIPHAGE DOSE-RESPONSE RESULTS: DOSE AND LOG SURVIVAL RATIO (N/N_o)

Dose	DR 1	DR 2	DR 3	DR 4	Average
20	-1.03	-1.01	-1.01	-0.93	-0.995
30				-1.47	-1.47
40	-1.98	-2.01	-2.02	-1.87	-1.97
50			-2.35	-2.23	-2.29
60			-2.74	-2.73	-2.74
80	-3.30	-3.33			-3.32
100	-3.91	-4.00			-3.96

Figure 4 presents the dose-response calibration developed for the bacteriophage. A best-fit line was developed using a quadratic expression (shown on Figure 4). Replication was good within a run (Appendix B) and among runs (Table 2), indicating that the bacteriophage responded consistently with respect to dose-response behavior. The correlation coefficient, r^2, was 0.9964. The correlation can be written as:

$$\left(\text{Log}\frac{N}{N_0}\right) = 1.52\text{x}10^{-4}D^2 - 5.47\text{x}10^{-2}D + 2.15\text{x}10^{-2} \qquad (2)$$

Where:

N = Final density (pfp/mL)
N_0 = Initial density (pfp/mL)
D = Dose (mW-s/cm^2)

The correlation can also be expressed in terms of dose as:

$$D = 2.96\left(\text{Log}\frac{N}{N_0}\right)^2 - 12.51\left(\text{Log}\frac{N}{N_0}\right) + 4.59$$

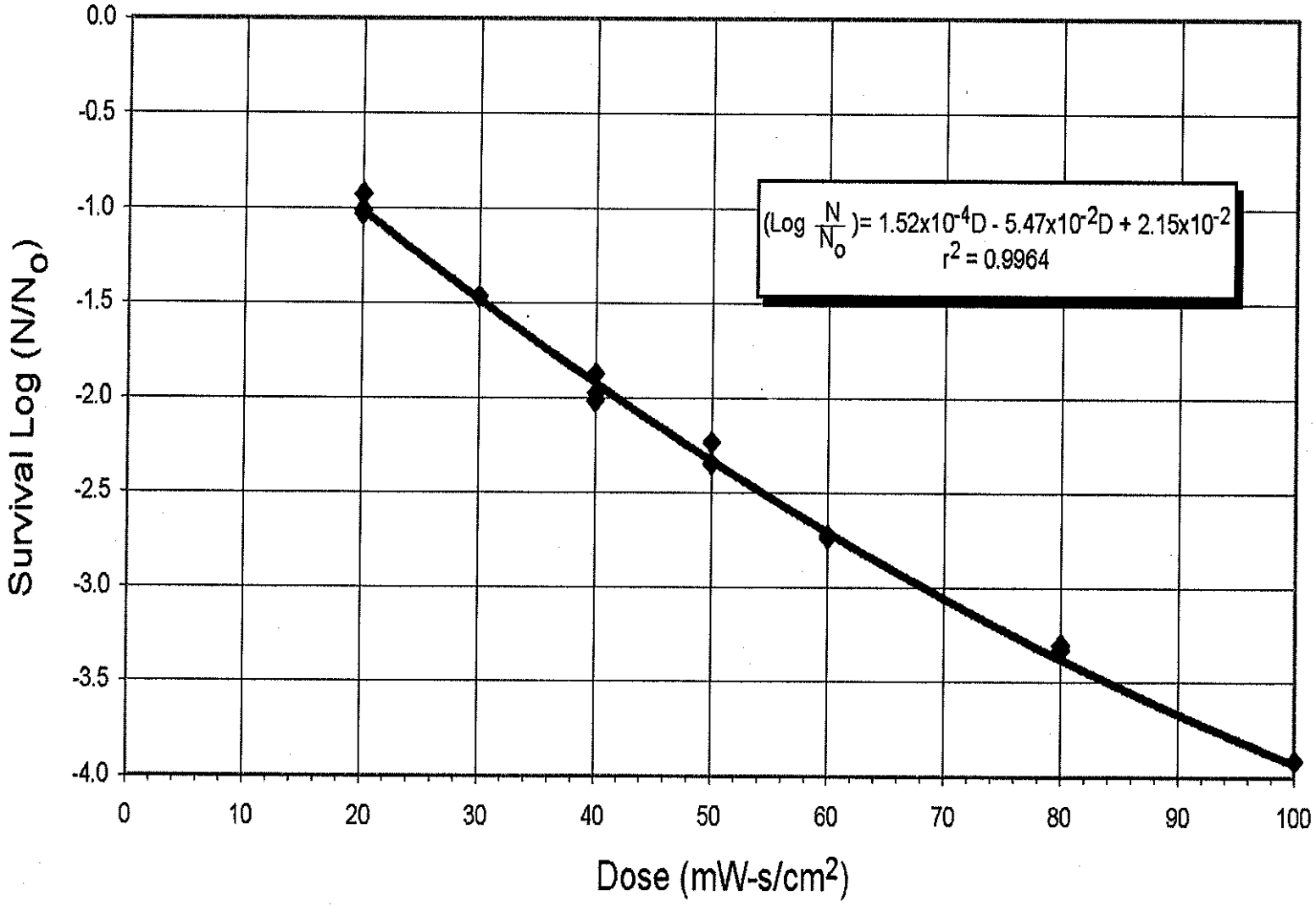


Figure 4. Dose-Response Calibration for Coliphage.

Hydraulic Characterization Test Results

Residence time distribution (RTD) analyses provide information on the actual or anticipated hydraulic behavior of a unit. Note that the critical hydraulic design requirement for UV reactors is that the system approach ideal plug-flow conditions and minimize any degree of advective mixing. Parameters that indicate these conditions are derived from an analysis of the RTD curves.

RTD curves developed for the test unit are presented in Appendix C. The top panel on each figure is the digitized tracer recording. The middle panel is the first derivative of the tracing showing the slope of the curve as a function of time. The lower panel plots the cumulative area under the residence time curve (middle panel) as a function of time, effectively showing the distribution of residence times in the system.

Table 3 summarizes key parameters derived from these RTD analyses. The flow rates and equivalent velocities through the lamp battery are given. The maximum velocity in this case was 0.71 ft/sec (22 cm/sec) at a flow of 1000 gpm (3785 Lpm). The theoretical detention time is computed as the volume (less the quartz/lamp assembly) divided by flow (V/Q), while the mean residence time (θ) is computed as the first moment of the residence time curve (middle panel of the Appendix C figures). Note that the detention times shown in Table 2 do not reflect the actual detention times in the lamp modules, but the detention time between injector and detector. The computed liquid volumes also account for the head variations as a function of flow.

Several dimensionless ratios can be derived from the RTD analysis which are useful in evaluating hydraulic characteristics. These are also presented on Table 3:

θ/T The ratio of the mean residence time to the theoretical residence time. This should fall between 0.8 and 1.2; it averaged 0.95 for these tests.

t_p/θ The ratio of the time at which the peak tracer level occurs to the mean residence time. An acceptable level is greater than 0.9, indicating absence of any skew in the residence time due to back mixing, dead spaces or eddying effects. This averaged 0.95.

t_{50}/θ The ratio of the time for 50 percent of the tracer to pass to the mean residence time is also a measure of the skew and should be greater than 0.9 for effective plug flow. It averaged 0.98 for these tests, with a range of 0.93 to 1.10.

t_i/θ The ratio of the time the tracer first appears to the mean residence time is a measure of short-circuiting, and should be greater than 0.5. This averaged 0.59 for these tests.

Table 3. Ondeo Degremont Hydraulic Testing - Summary of Residence Time Analyses

Run Number	Flow (gpm)	Flow (Lpm)	Velocity (fps)	Velocity (cm/sec)	Theoretical (sec)	Mean (sec)	Ratio Mean/Theo θ/T	t_p/θ	t_{50}/θ	t_i/θ	t_{90}/t_{10}	d	E (cm^2/sec)
1	200	757	0.15	4.59	44.9	40.5	0.90	1.04	1.01	0.62	2.0	0.037	40
2	200	757	0.15	4.57	44.9	39.2	0.87	0.92	0.96	0.62	2.0	0.037	41
3	200	757	0.15	4.57	44.9	41.9	0.93	0.92	1.10	0.53	2.3	0.048	50
4	400	1514	0.29	8.84	22.6	20.8	0.92	0.97	1.00	0.56	2.1	0.046	96
5	400	1514	0.29	8.84	22.6	21.7	0.96	0.94	0.97	0.51	1.9	0.013	25
6	400	1514	0.29	8.84	22.6	20.5	0.91	0.97	0.97	0.59	2.1	0.038	81
7	600	2271	0.43	13.11	15.1	14.5	0.96	1.00	0.97	0.62	1.9	0.033	100
8	600	2271	0.43	13.11	15.1	13.8	0.91	0.95	0.94	0.58	1.8	0.034	108
9	600	2271	0.43	13.11	15.1	13.9	0.92	1.20	1.00	0.58	2.3	0.050	157
10	800	3028	0.57	17.37	11.9	11.8	0.99	1.00	1.00	0.51	2.1	0.039	143
11	800	3028	0.57	17.37	11.9	12	1.01	1.10	1.00	0.58	1.9	0.032	116
12	800	3028	0.57	17.37	11.9	12.7	1.07	0.87	0.94	0.71	1.5	0.011	36
13	1000	3785	0.71	21.64	9.6	8.9	0.93	0.90	1.01	0.56	2.2	0.049	240
14	1000	3785	0.71	21.64	9.6	9.3	0.97	0.86	0.97	0.65	1.9	0.030	141
15	1000	3785	0.71	21.64	9.6	8.6	0.90	0.81	0.93	0.58	2.3	0.040	200
						Average	0.95	0.96	0.98	0.59	2.0	0.036	86*

* Geometric mean

Acceptable criteria

- $0.8 \le \theta/T \le 1.2$
- $t_p/\theta > 0.90$
- $t_{50}/\theta > 0.90$
- $t_i/\theta > 0.50$
- $t_{50}/t_{10} \le 2.0$
- $d < 0.50$
- $E < 100\ cm^2/sec$

t_{90}/t_{10} The ratio of the time for 90 percent of the tracer to pass to the time for 10 percent of the tracer to pass. Also known as the Morrill Dispersion Index, it is a measure of the spread of the residence time distribution curve; a value of 1.0 would indicate ideal plug flow, and 21.9 for ideal complete mix. A value of 2.0 or less is generally required for UV systems; this index averaged 2.0 for this system, with a range of 1.5 to 2.3.

The dispersion coefficient, E, was also computed from the RTD analysis, yielding an average (geometric) value of 86 with a range of 25 to 240. E can vary from zero to infinity, approaching zero under ideal plug flow conditions. An E less than 100 cm^2/sec is generally targeted for UV disinfection reactors; the test results show levels below this guidance limit. An additional parameter, the dimensionless dispersion number, d, is given on Table 2; this averaged 0.036 which falls below the acceptable upper limit of 0.05 for plug-flow conditions.

Bioassay Test Results

The bacteriophage and UV transmittance data for each field run are presented in Appendix D, Tables D1 through D4. The dose and flow data are presented on Figure 5. The flow-dose relationship determine for each HO10 module at a 65% transmittance and a 0.8 lamp output reduction factor is:

$$D_B = 1828Q^{-0.735} \tag{3}$$

where D_B is dose per lamp bank, with units $mW\text{-}s/cm^2$, and Q is flow in gpm. The expression has a correlation coefficient, r^2, of 0.97.

Expressions were also calculated for dose-flow relationships at 55% and 75% transmittance, and are shown on Figure 5. These curves were developed by adjusting the coefficient from the flow-dose relationship observed at 65% transmittance. This was done by multiplying the ratio of the calculated reactor intensity at either 55% or 75% to the calculated reactor intensity at 65% transmittance (see Figure 3) times the coefficient in Equation (3):

$$\left(\frac{I_{avg}@X\%T}{I_{avg}@65\%T}\right) x1828Q^{-0.735} \tag{4}$$

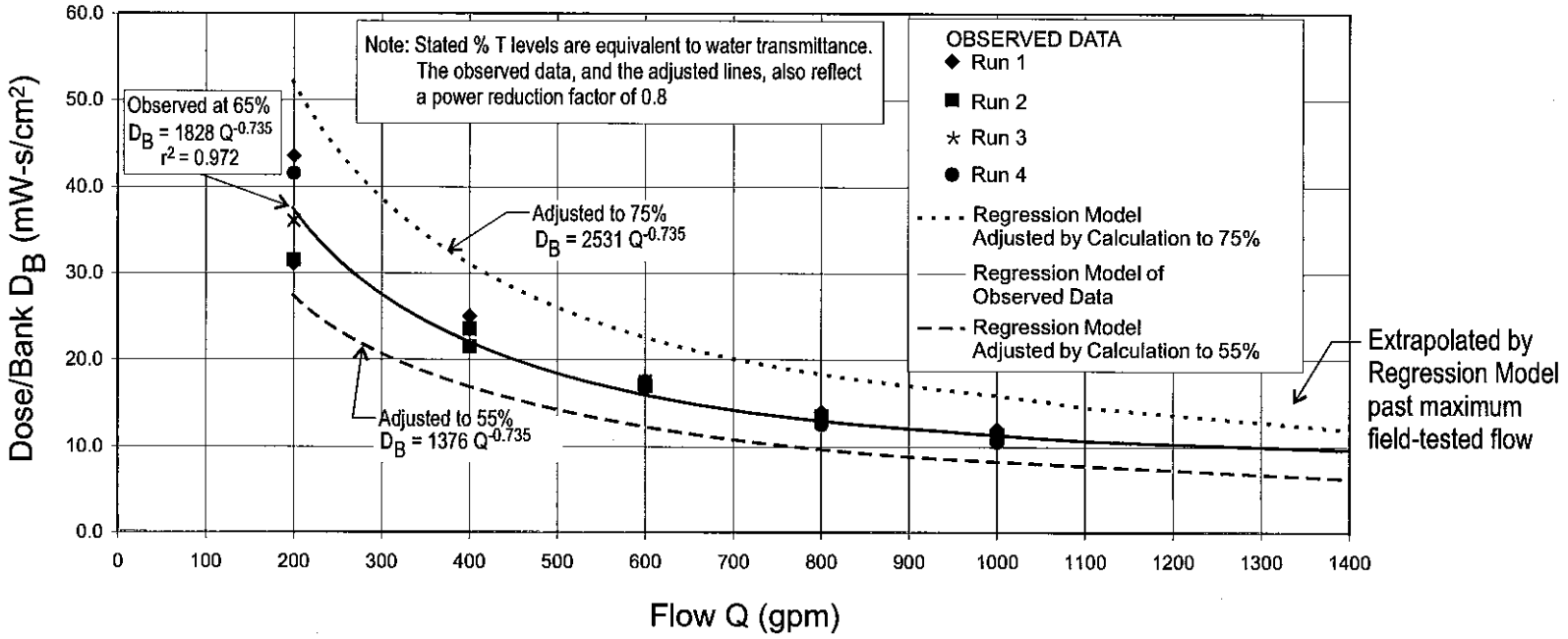


Figure 5. Flow-Dose Relationships for the Ondeo Degremont Aquaray HO10.

The resulting expressions are:

at 55% Transmittance

$$D_B = 1376Q^{-0.735} \tag{5}$$

at 75% Transmittance

$$D = 2531Q^{-0.735} \tag{6}$$

It should be noted that the bioassay testing was conducted on two hydraulically scaleable 10-lamp modules. The standard commercially available module, however is a 40-lamp module. The bioassay relationship, when analyzed on a per-bank basis, can be linearly scaled to represent a 40-lamp module. This is presented as Figure 6.

The equivalent flow-dose relationship for an HO40 module at 65% transmittance and a 0.8 lamp output reduction factor is:

$$D_B = 413Q^{-0.735} \tag{7}$$

where D_B is dose per lamp bank with units of mWs/cm^2 and Q is mgd. Similar for the 10-lamp modules, calculated doses were determined for an equivalent 40-lamp module for both 55% and 75% transmittance conditions. The resulting expression in this case are:

$$\begin{aligned} &For\ T = 55\%\ \ D_B = 310^{-0.735} \\ &For\ T = 75\%\ \ D_B = 572^{-0.735} \end{aligned} \tag{8}$$

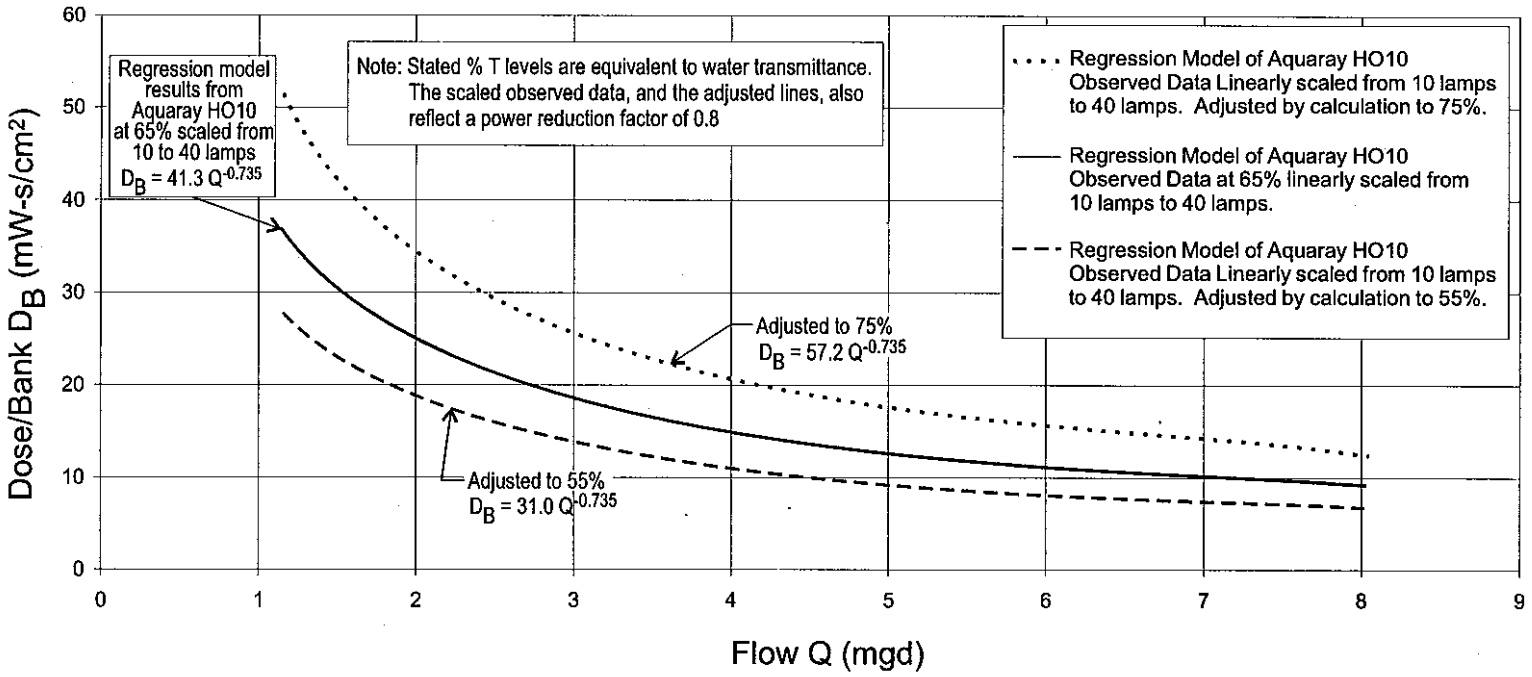


Figure 6. Flow-Dose Relationships for the Ondeo Degremont Aquaray HO40.

General Safety Precautions

Aquaray® VLS Disinfection Equipment

INDEX

GENERAL SAFETY PRECAUTIONS

Aquaray® VLS Disinfection Equipment

1.1 GENERAL SAFETY PRECAUTIONS:

All UV equipment must be installed, put in operation, and maintained by trained technical personnel. The owner and/or user, must ensure that ALL operating personnel have been properly trained.

This equipment has been subjected to a hazard analysis. Corresponding precautionary measures regarding the safety of persons and domestic animals have been made. Nevertheless, it is possible that danger could arise as a result of incorrect use, bad maintenance, material changes, etc. These dangers are associated with:

- Electrical Dangers
- Mechanical Dangers
- Exposure to high intensity UV Light

1.1.1 ELECTRICAL DANGERS:

NOTICE:

Before working on any electrical equipment, it must be guaranteed that all parts are voltage-free, and unintentional switching to an “ON” posistion is not possible. To switch off, use the related circuit breaker in the Power Distribution Center (PDC).

WARNING:

OPERATING ANY DEVICES UNDER VOLTAGE IS TO BE FORBDDEN.

Generally, no work is to be executed on devices which are under voltage. If this cannot be avoided, the work may only be accomplished in accordance with the rules and regulations at the installation site of the plant and only by trained technical personnel.

Due to electrical danger and risk, it is ***NOT*** recommended to wash down or spray any conducting liquids to exposed electrical components.

WARNING:

After switching all devices off, the service section must be checked to ensure that there is no voltage available. ***A LOCKOUT DEVICE IS RECOMMENDED TO BE USED AT ALL TIMES***.

For the measurement of signal voltages, a suitable measuring instrument with an internal resistance of at least 10 kΩ/V must to be used.

If protective covers must be removed for work (commissioning, service, or repair), it must be guaranteed that they are again properly attached and re-installed after finishing the work. If the device in the exceptional case must be set under voltage despite dismantled protective covers, then the endangered range is to be shut off and marked by warning notices.

1.1.2 MECHANICAL DANGERS:

1.1.2.1 Lifting Tension Force:

A suitable lifting tension force which corresponds to the local safety regulations has to be followed. It has to be guaranteed that the permissible maximum load of the lifting attachment is not exceeded. Refer to the plate on the device for the maximum load.

All supporting device components can corrode over time. All devices have to be checked to ensure their load carrying ability before they are used for lifting and transporting components.

A minimum of two (2) people are required to move modules in and out the channel. One (1) to operate the hoist, and one (1) to steady and position the module. Whether the presence of a third operator is required, always keep in mind local safety regulations.

When lifting a UV module or UV bank, use only the lifting equipment delivered with the UV system. Operators must be familiar with the lifting equipment and must follow all applicable rules regarding its use.

CAUTIONS:

Each UV module is top heavy. It should always be placed on a flat, level surface. Never lean the UV modules.

Do not stand under hoisted modules or lift modules over people. Modules should never be suspended from any device unattended.

1.1.2.2 Open Channels:

When a channel is open due to removed UV modules, eye shields, or grating there is an increased risk of danger and injury. Always put an appropriate cover over the open area and prevent access by placing a barrier and posting visible warning signs.

1.1.2.3 Open Cleaning Tank:

Always keep the provided cover on the tank when not in use and prevent access by placing a barrier and posting visible warning signs while equipment is in operation.

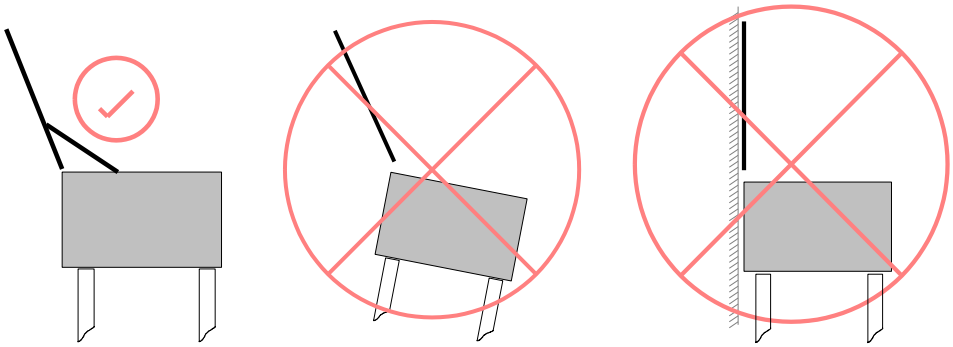
1.1.2.4 Glass Saftey:

When working with parts made of glass (e.g. lamp and quartz jackets) consider that glass can break or splinter which can cause serious injuries. Always wear appropriate gloves to protect you from lacerations.

1.1.2.5 Open Lid:

WARNING:

Only open the UV module lid when the module is in an upright position and ensure the lid is opened completely. Use the mechanical device to assure the lid in the open position as shown in the diagram below. Failure to follow these instructions can lead to injury.



CAUTION:

Don't open the lid of the UV-module during inclimate weather condtions (rainfall, snowfall, etc) unless you use an appropriate cover to protect the opened UV equipment against humidity and other potential hazards.

CAUTION:

If humidity enters the UV module and condensation appears, the electrical connections have to be removed to prevent any health or material damages. Before taking the UV module back in operation, the UV module has to be dried out completely.

1.1.2.6 Moving Parts:

During the operation, maintenance, and/or repair of any device, components such as the wiper system, which have dangerous moving parts should be handled by a trained personnel. If they are not removed by trained personnel, they could cause damage to the module or serious injury.

1.1.3 EXPOSURE TO HIGH INTENSITY UV LIGHT:

The most effective approach is to simply avoid exposure to UV irradiation. Routine operation and maintenance of the UV disinfection system can be accomplished without exposure to UV irradiation. It is always good to keep in mind at all times of the following tips:

- Ensure proper installation of UV safety equipment including all eye shields and UV warning signs.

- Avoid exposure to UV rays.
- If exposure to UV rays cannot be avoided, be sure to limit this exposure to no more than a few minutes.

ALWAYS:

- Wear approved safety goggles
- Wear UV face shield over the safety goggles
- Wear Protective Clothing such long sleeve shirts and pants

For more details, please follow the Safety Considerations chapter in the Operating Instructions Manual.

1.2 ADDITIONAL DANGERS:

Manuals cannot foresee each conceivable case of location, operation or maintenance. Therefore, only essential notes are contained in these operating instructions, which are required for qualified personnel with intended use of UV-modules in use of waste water treatment.

Notice:

Protect all UV equipment against inadmissible stress (temperature, moisture, impact, etc.). Avoid contact with electronic components (static discharge!). Observe all suitable reference labels.

Avoid any eye and long skin contact with the desiccant bags and the moisture indication strip. Wash hands throughly after handling these items.

1.3 SPECIFICATIONS FOR AN EMERGENCY:

NOTICE:

The operator has to ensure that the required conditions for rapid first aid measures are met in accordance with the local regulations. If necessary also recommendations or guidelines from accident prevention companies are to be considered.

1.4 ORGANIZATION OF PERSONNEL:

It must be guaranteed that before the installation and first commissioning, that this general safety document and the complete operation manual of the UV Disinfection System is carefully read and understood by all responsible personnel, this is to ensure the safe installation, operation, and maintenance of the UV system. The operations manual shall contain all required information for the operation and maintenance of the equipment.

The UV equipment may be installed, commissioned, and maintained only by authorized technical personnel. The operator must ensure that all authorized operating staff be properly trained.

MATERIAL SAFETY DATA SHEETS
DEFINITIONS

(Accepted by OSHA as essentially familiar to OSHA Form 20)

These pages are intended for use with Material Safety Data Sheets (MSDS) supplied in Section A of the O &M Manual. Questions concerning these chemical products and the information contained on a specific MSDS should be directed to the Manufacturer as listed in Section 1 – PRODUCT INFORMATION**.**

ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
CAS	Chemical Abstract Service
DOT	Department of Transportation
HMIS	Hazardous Material Identification System
IARC	International Agency Research on Cancer
NA	Not Applicable
NE	Not Established
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Act of 1970
PEL	Permissible Exposure Limit (8-hour time weighted average)
RTECS	Registry of Toxic Effects of Chemical Substances
STEL	Short Term Exposure Limit (for 15-minute period)
TLV	Threshold Limit Value (8-hour time weighed average)
TCSA	Toxic Substance Control Act (EPA inventory of toxic substances.)

The upper right-hand corner contains the HMIS hazard ratings for the product. Each product is rated for acute health, flammability, and reactivity on a scale of 9 (minimal hazard) to 4 (severe hazard).

CHEMICAL IDENTITY

The identity of the substance as it appears on the label.

SECTION I – PRODUCT IDENTIFICATION

Provides product identification including: Product and manufacturer name, DOT classification, names of substances if listed on EPA Priority Pollutants List, CAS Registry Number, and generic description of the product.

MATERIAL SAFETY DATA SHEET
GERMICIDAL/U.V. LAMPS

Germicidal lamps offered by OZONIA NORTH AMERICA are exempted from the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) because they are "articles." The following information is provided by OZONIA NORTH AMERICA. as a courtesy to its customers.

I. PHYSICAL PROPERTIES

Not applicable to intact lamp.

II. FIRE AND EXPLOSION HAZARDS

Flammability: Non- combustible
Fire Extinguishing Materials: Use extinguishing media suitable for surrounding fire.
Special Firefighting Procedures: Use a self contained breathing apparatus to prevent inhalation of dust and/or fumes that may be generated from broken lamps during firefighting activities.
Unusual Fire and Explosion Hazards: When exposed to high temperature toxic fumes may be released from broken lamps.

III. REACTIVITY DATA

Stability: Stable
Conditions to avoid: None for intact lamps.
Incompatibility (materials to avoid): None for intact lamps.
Hazardous Decomposition Products: None for intact lamps
Hazardous Polymerization Products: Will not occur.

IV. HEALTH HAZARDS

THERE ARE NO KNOWN HEALTH HAZARDS FROM LAMPS THAT ARE INTACT. No adverse effects are expected from occasional exposure to broken lamps. As a matter of good practice, avoid prolonged or frequent exposure to broken lamps unless there is adequate ventilation. The major hazard from broken lamps is the possibility of sustaining glass cuts.
EFFECTS OF OVEREXPOSURE TO BROKEN LAMPS BY INHALATION, INGESTION, OR CONTACT WITH SKIN OR EYE.
Mercury - Exposure to high concentrations of vapors for brief periods can cause acute symptoms such as pneumonitis, chest pains, shortness of breath, coughing, gingivitis, salivation, and possibly stomatitis. Chronic exposure may cause tremors and neuropsychiatric problems. May cause redness and irritation as a result of contact with skin and/or eyes.
Quartz(fused silica) - Exposure to crystalline silica dust may cause scarring of the lungs (Silicosis), resulting in shortness of breath and coughing.
Inert gases - Inert gases such as Argon, Neon, and Xenon can cause asphyxia by displacing the ambient oxygen. Some symptoms of asphyxia are headache and dizziness.
Tin/Lead Solder - Ingestion or inhalation of dust or fumes must be avoided. Lead is toxic and cumulative, affecting the kidneys, reproductive system, and nervous system. Symptoms of chronic overexposure include anemia, insomnia, weakness, irritability, constipation and stomach pains. Tin is not regarded as toxic but excessive exposure can cause fever, nausea, stomach cramps or diarrhea.

V. PROCEDURES FOR DISPOSAL OF LAMPS

If lamps are broken, ventilate area where breakage occurred. Clean up with mercury vacuum cleaner or other suitable means that avoid dust and mercury vapor generation. Take usual precautions for collection of broken glass. Clean up requires special care due to mercury droplet proliferation. Place materials in closed containers to avoid generating dust.
It is the responsibility of the generator to ensure proper classification of waste products. To that end, TCLP tests should be conducted on all waste products to determine the ultimate disposition in accordance with all applicable federal, state, and local regulations.

CHECKED:	TITLE: AQUARAY® 40 VLS **MSDS Germicidal UV Lamps**			SHT: 1 of 2
APPROVED: WY11.08.05	OZONIA NORTH AMERICA 600 Willow Tree Road Leonia, NJ 07605	A	DWG No. 18000-77-0053	REV: -

VI. SPECIAL HANDLING INFORMATION - FOR BROKEN LAMPS

Ventilation: Use adequate general and local exhaust ventilation to maintain exposure levels below the PEL or TLV limits. If such ventilation is unavailable, use respirators as specified below.
Respiratory Protection: Use appropriate NIOSH approved respirator if airborne dust concentrations exceed the PEL or TLV limits. All appropriate requirements set forth in 29 CFR 1910.134 should be met.
Eye Protection - OSHA specified safety glasses, goggles or face shield are recommended if lamps are being broken.
Hygienic Practices - After handling broken lamps, wash thoroughly before eating, smoking, or using toilet facilities.

ISSUED: 11/16/05 **FOR QUESTIONS CALL: OZONIA NORTH AMERICA (201)-794-3100**

CHECKED:	TITLE: AQUARAY® 40 VLS **MSDS Germicidal UV Lamps**			SHT: 2 of 2
APPROVED: WY11.08.05	OZONIA NORTH AMERICA 600 Willow Tree Road Leonia, NJ 07605	A	DWG No. 18000-77-0053	REV: -

MERCURY

MATERIAL SAFETY DATA SHEET

(MSDS)

SPENT LOW PRESSURE MERCURY VAPOR LAMPS USED IN THE AQUARAY® ULTRAVIOLET (UV) DISINFECTION SYSTEM ARE TO BE DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS GOVERNING FLUORESCENT LAMP DISPOSAL FOR COMMERCIAL/RESIDENTIAL LIGHTING

CHECKED: JPS12/16/09	TITLE: MERCURY MATERIAL SAFETY DATA SHEET (MSDS)			SHT: 1 of 8
APPROVED: WY 12/16/09	OZONIA NORTH AMERICA 600 WILLOW TREE ROAD LEONIA, NJ 07605	A	DWG No. 18000-77-0082	REV: **A**

Section 1: Chemical Product and Company Identification

Product Name: Mercury

Catalog Codes: SLM3505, SLM1363

CAS#: 7439-97-6

RTECS: OV4550000

TSCA: TSCA 8(b) inventory: Mercury

CI#: Not applicable.

Synonym: Quick Silver; Colloidal Mercury; Metallic Mercury; Liquid Silver; Hydragyrum

Chemical Name: Mercury

Chemical Formula: Hg

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Mercury	7439-97-6	100

Toxicological Data on Ingredients: Mercury LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Hazardous in case of skin contact (permeator).
CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.
The substance may be toxic to blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS).
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
When thrown into mercury vapor, boron phosphodiiodide ignites at once.
Flame forms with chlorine jet over mercury surface at 200 deg to 300 deg C.
Mercury undergoes hazardous reactions in the presence of heat and sparks or ignition.

Special Remarks on Explosion Hazards:
A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium.
CHLORINE DIOXIDE & LIQUID HG, WHEN MIXED, EXPLODE VIOLENTLY.
Mercury and Ammonia can produce an explosive compound.
A mixture of the dry carbonyl and oxygen will explode on vigorous shaking with mercury.
Methyl azide in the presence of mercury was shown to be potentially explosive.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Corrosive liquid. Poisonous liquid.
Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 25°C (77°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.025 from ACGIH (TLV) [United States] SKIN
TWA: 0.05 CEIL: 0.1 (mg/m3) from OSHA (PEL) [United States] Inhalation
TWA: 0.025 (mg/m3) [United Kingdom (UK)]
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Heavy liquid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 200.59 g/mole

Color: Silver-white

pH (1% soln/water): Not available.

Boiling Point: 356.73°C (674.1°F)

Melting Point: -38.87°C (-38°F)

Critical Temperature: 1462°C (2663.6°F)

Specific Gravity: 13.55 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 6.93 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

(amalga) with many laboratory and electrical contact metals, can cause severe corrosion problems in laboratories.
Special precautions: Mercury can attack copper and copper alloy materials.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC.
May cause damage to the following organs: blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion, of inhalation.
Hazardous in case of skin contact (corrosive, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May affect genetic material.
May cause cancer based on animal data.
Passes through the placental barrier in animal.
May cause adverse reproductive effects(paternal effects- spermatogenesis; effects on fertility - fetotoxicity, post-implantation mortality), and birth defects.

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Mercury UNNA: 2809 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Mercury
California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Mercury
Connecticut hazardous material survey.: Mercury
Illinois toxic substances disclosure to employee act: Mercury
Illinois chemical safety act: Mercury
New York acutely hazardous substances: Mercury
Rhode Island RTK hazardous substances: Mercury
Pennsylvania RTK: Mercury
Minnesota: Mercury
Massachusetts RTK: Mercury
New Jersey: Mercury
New Jersey spill list: Mercury
Louisiana spill reporting: Mercury
California Director's List of Hazardous Substances.: Mercury
TSCA 8(b) inventory: Mercury
SARA 313 toxic chemical notification and release reporting: Mercury
CERCLA: Hazardous substances.: Mercury: 1 lbs. (0.4536 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
CLASS E: Corrosive liquid.

DSCL (EEC):
R23- Toxic by inhalation.
R33- Danger of cumulative effects.
R38- Irritating to skin.
R41- Risk of serious damage to eyes.
R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S2- Keep out of the reach of children.
S7- Keep container tightly closed.
S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S39- Wear eye/face protection.
S45- In case of accident or if you feel unwell,

seek medical advice immediately (show the label where possible).
S46- If swallowed, seek medical advice immediately and show this container or label.
S60- This material and its container must be disposed of as hazardous waste.

S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Full suit.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:22 PM

Last Updated: 11/06/2008 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

POTENTIAL HAZARDS

HEALTH HAZARDS

Contact causes burns to skin and eyes.
If inhaled, may be harmful.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.
Flammable/poisonous gases may accumulate in tanks and hopper cars.
Some of these materials may ignite combustibles (wood, paper, oil, etc.)

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind; keep out of low areas.
Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.
CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE.
If water pollution occurs, notify the appropriate authorities.

FIRE

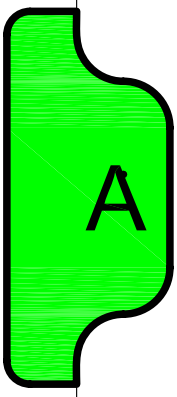
Some of these materials may react violently with water.
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk.
Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from the ends of tanks.

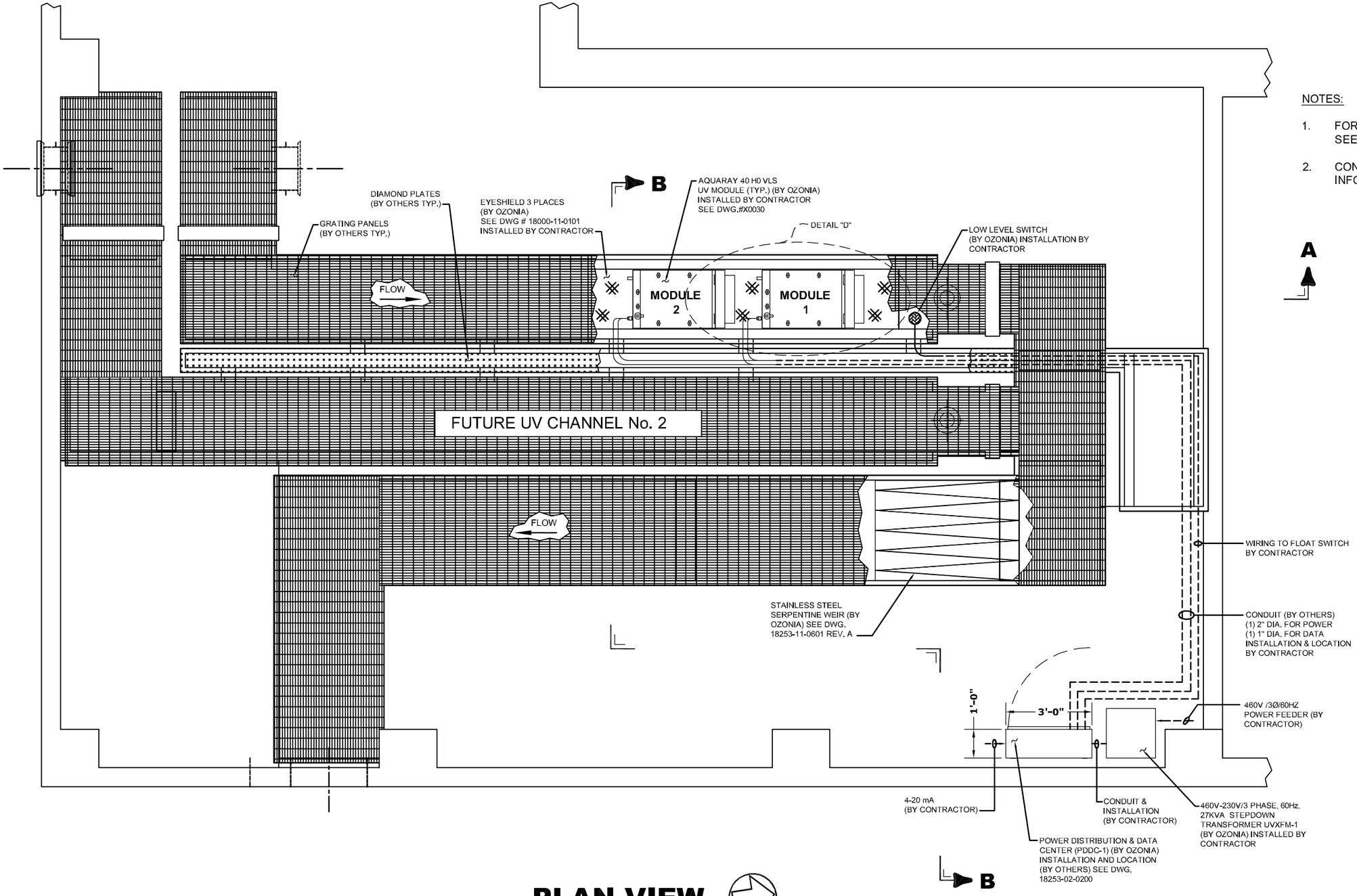
SPILL OR LEAK

Do not touch or walks through spilled material; stop leak if you can do it without risk.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
Large Spills: Dike far ahead of liquid spill for later disposal.

FIRST AID

Move victim to fresh air; call emergency medical care.
In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes.
Remove and isolate contaminated clothing and shoes at the site.
Keep victim quiet and maintain normal body temperature.


A



PLAN VIEW

NOTES:

1. FOR SECTIONS & DETAILS OF LAYOUT, SEE SHEETS 2 & 3 OF THIS DRAWING.
2. CONTACT OZONIA IF ADDITIONAL INFORMATION REQUIRED.

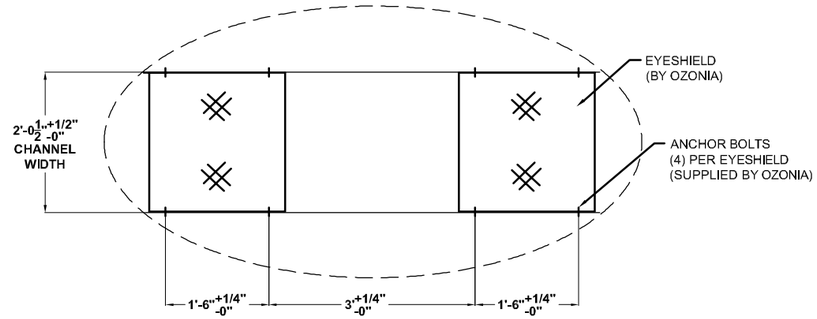
REV.	DESCRIPTION	DRAWN	APPD.	DATE
A	CORRECTED AS PER CUSTOMER'S COMMENTS	LC	LC	4/12/12

SCALE: NONE
DRAWN: 10/28/11 LC
CHECKED: 10/28/11 LC
APPROVED:

TITLE: SYSTEM PLAN LAYOUT
AQUARAY 40 HO VLS DISINFECTION SYSTEM
HAROLD D. THOMPSON REGIONAL WRF - FOUNTAIN, CO

OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NJ 07605 USA

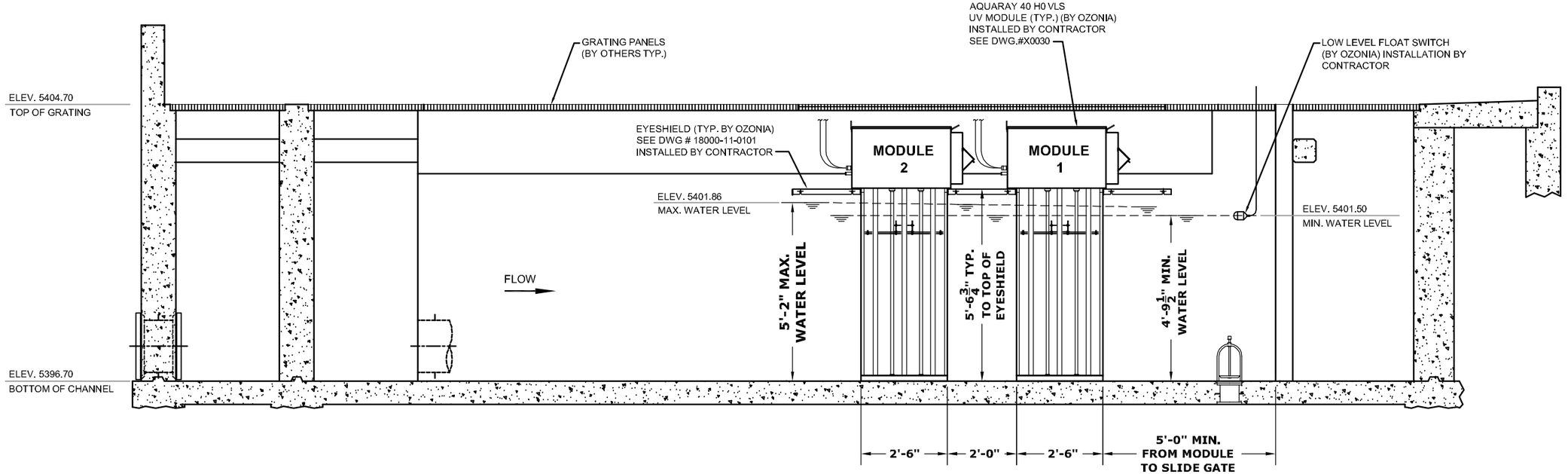
SIZE: B
DWG. NO.: 18253-77-0201
SHT.: 1 OF 4
REV.: A



DETAIL "D"
EYESHIELD ANCHOR BOLT LAYOUT
(MODULES NOT SHOWN FOR CLARITY)

NOTES:

1. FOR ADDITIONAL SECTIONS & DETAILS OF LAYOUT SEE SHEET 3 OF THIS DRAWING.
2. FOR PLAN VIEW OF LAYOUT SEE SHEET 1 OF THIS DRAWING.



SECTION A-A'

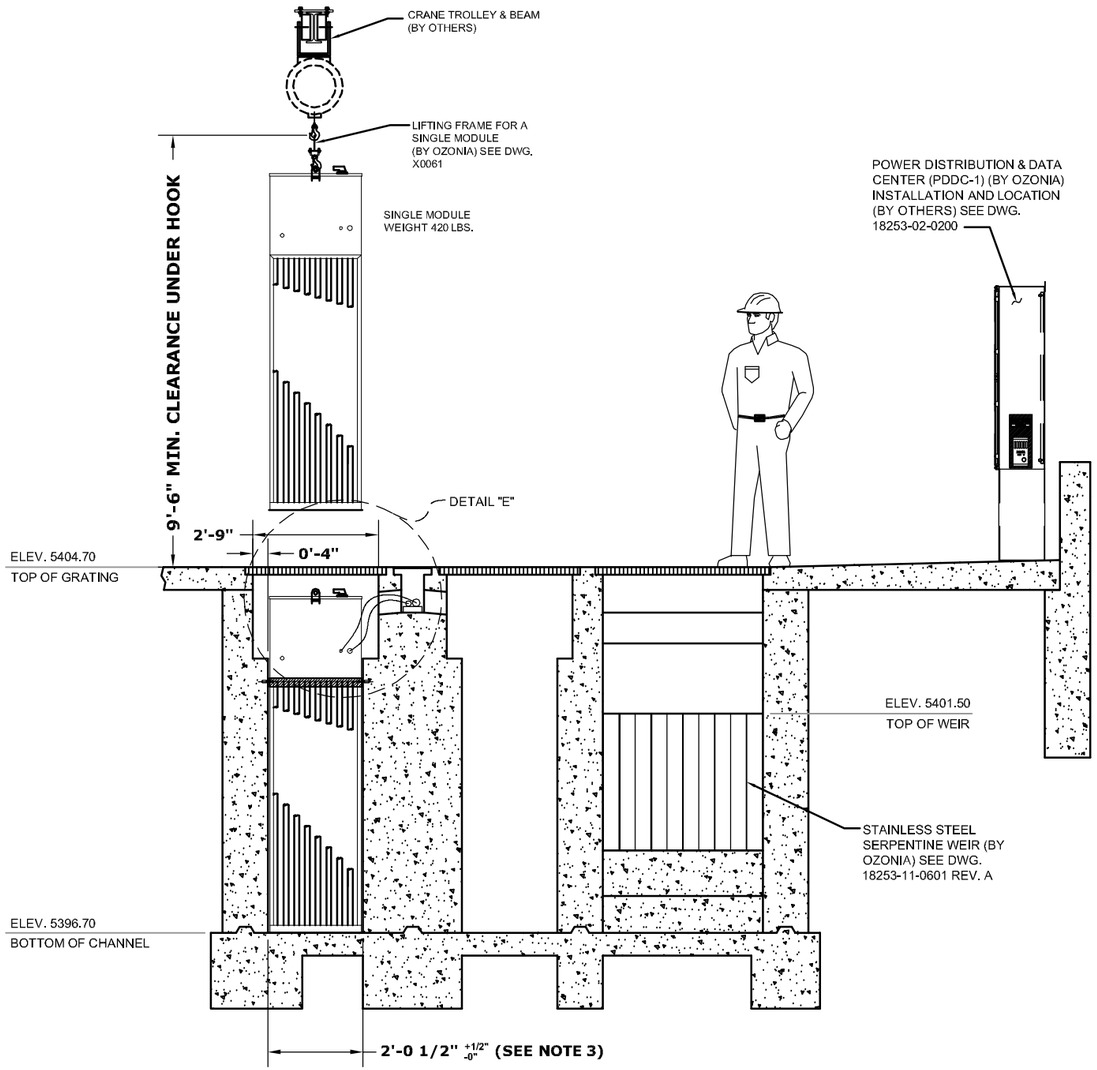
REV.	DESCRIPTION	DRAWN	APPD.	DATE
A	CORRECTED AS PER CUSTOMER'S COMMENTS	LC	LC	4/12/12

SCALE: NONE
DRAWN: 10/28/11 LC
CHECKED: 10/28/11 LC
APPROVED:

TITLE: SECTIONS & DETAILS ASSEMBLY
AQUARAY 40 HO VLS DISINFECTION SYSTEM
HAROLD D. THOMPSON REGIONAL WRF - FOUNTAIN, CO

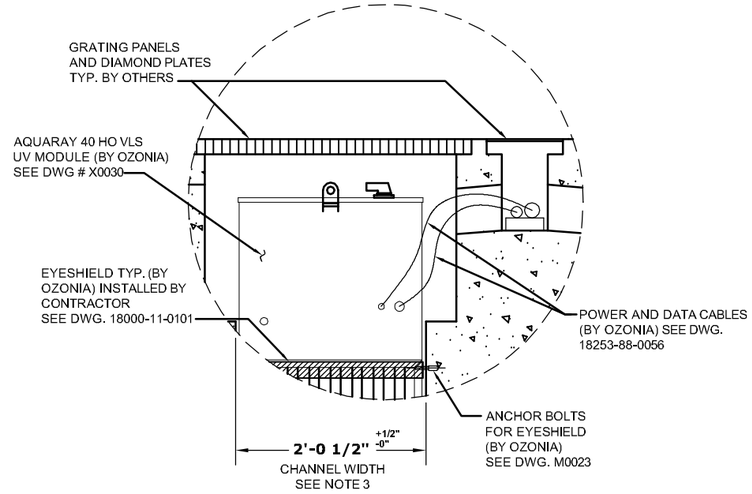
OZONIA
OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NJ 07605 USA

SHT.: 2 OF 4
SIZE: B
DWG. NO.: 18253-77-0201
REV.: A



NOTES:

1. FOR SECTIONS & DETAILS OF LAYOUT, SEE SHEETS 2 & 3 OF THIS DRAWING.
2. FOR PLAN VIEW OF LAYOUT SEE SHEET 1 0F THIS DRAWING.
3. THIS DIMENSION IS THE MINIMUM WIDTH OF CHANNEL. EFFORT MUST BE MADE TO MAINTAIN WIDTH AND SQUARENESS TO ALLOW INSTALLATION OF THE MODULES WITH OUT INTERFERANCE. DIMENSIONS TO BE CONFIRMED BY CONTRACTOR.
4. FOR WEIR DETAIL SEE SHEET 4 OF THIS DRAWING.



DETAIL "E"

SECTION B - B'

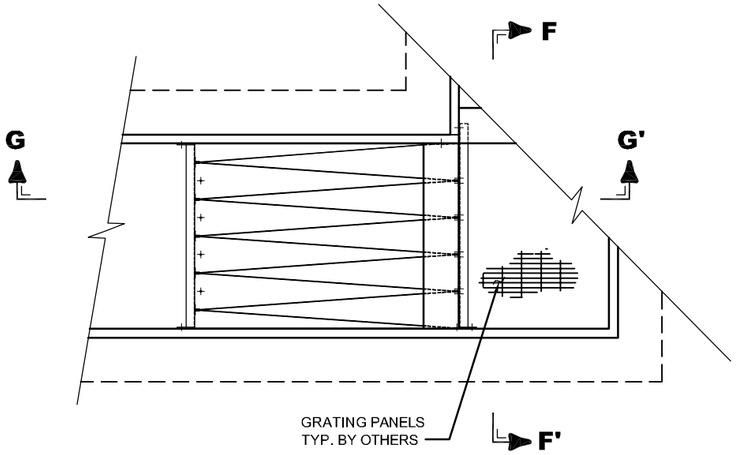
REV.	DESCRIPTION	DRAWN	APPD.	DATE
A	CORRECTED AS PER CUSTOMER'S COMMENTS	LC	LC	4/12/12

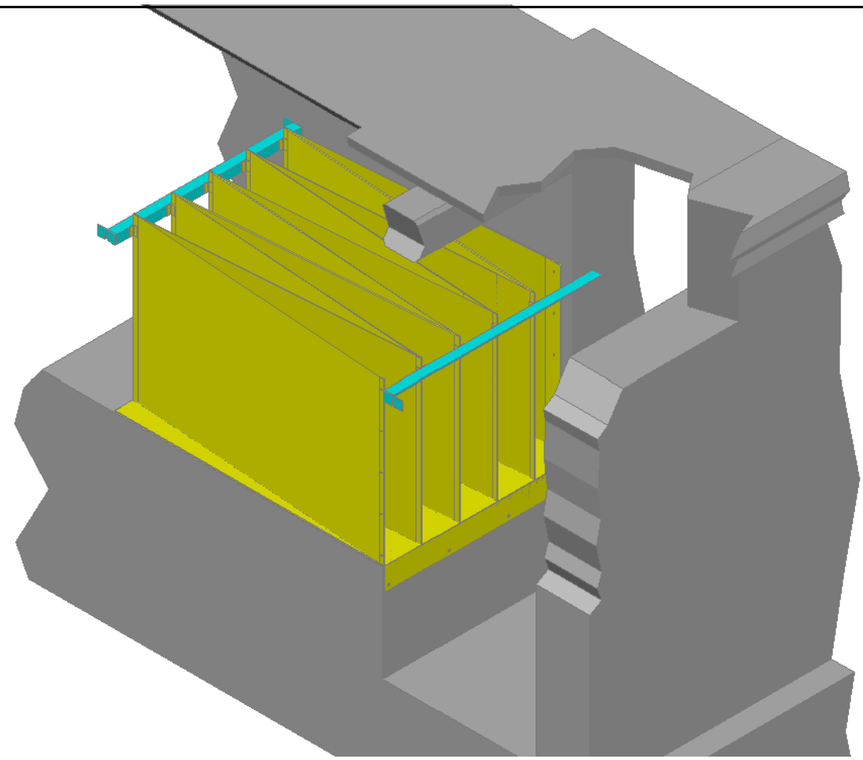
SCALE:	NONE
DRAWN:	10/28/11 LC
CHECKED:	10/28/11 LC
APPROVED:	

TITLE: SECTIONS & DETAILS ASSEMBLY
AQUARAY 40 HO VLS DISINFECTION SYSTEM
HAROLD D. THOMPSON REGIONAL WRF - FOUNTAIN, CO

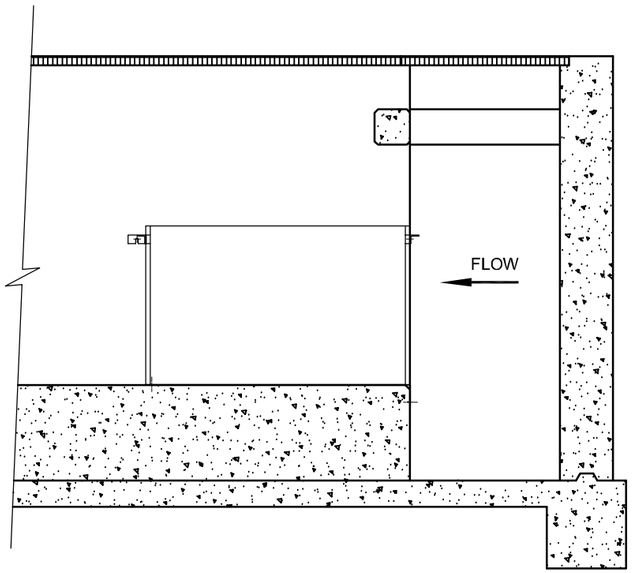
OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NJ 07605 USA

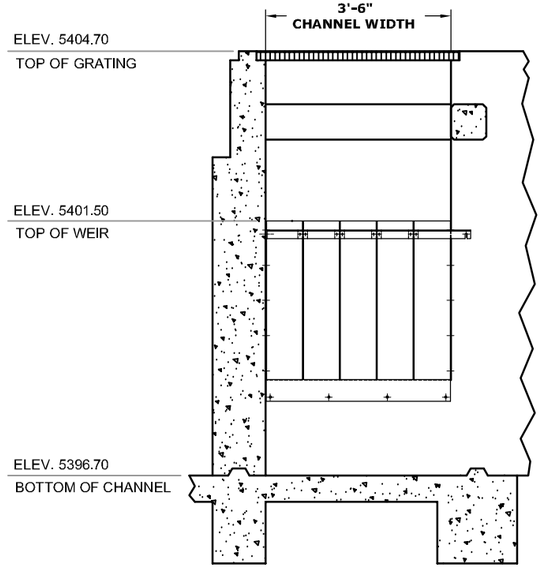
SIZE: B
DWG. NO.: 18253-77-0201
REV.: A
SHT.: 3 OF 4





STAINLESS STEEL
SERPENTINE WEIR (BY
OZONIA) SEE DWG.
18253-11-0601 REV.A





NOTES:

1. SERPENTINE WEIR TO BE MADE IN 304L S.S. 12 GA. (BY OZONIA)
2. FIELD CAULKING REQ'D ON ALL SEAMS AFTER ASSEMBLY FOR WATER TIGHT CONSTRUCTION.
3. CONCRETE WORK, HARDWARE AND INSTALLATION BY CONTRACTOR

SECTION G - G'

SECTION F - F'

REV.	DESCRIPTION	DRAWN	APPD.	DATE
A	CORRECTED AS PER CUSTOMER'S COMMENTS	LC	LC	4/12/12

SCALE: NONE
DRAWN: 10/28/11 LC
CHECKED: 10/28/11 LC
APPROVED:

TITLE: SECTIONS - WEIR TROUGHS
AQUARAY 40 HO VLS DISINFECTION SYSTEM
HAROLD D. THOMPSON REGIONAL WRF - FOUNTAIN, CO

OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NJ 07605 USA

SHT.: 4 OF 4
SIZE: B
DWG. NO.: 18253-77-0201
REV.: A

B

AQUARAY® 40 VLS UV DISINFECTION SYSTEM
OPERATING INSTRUCTIONS

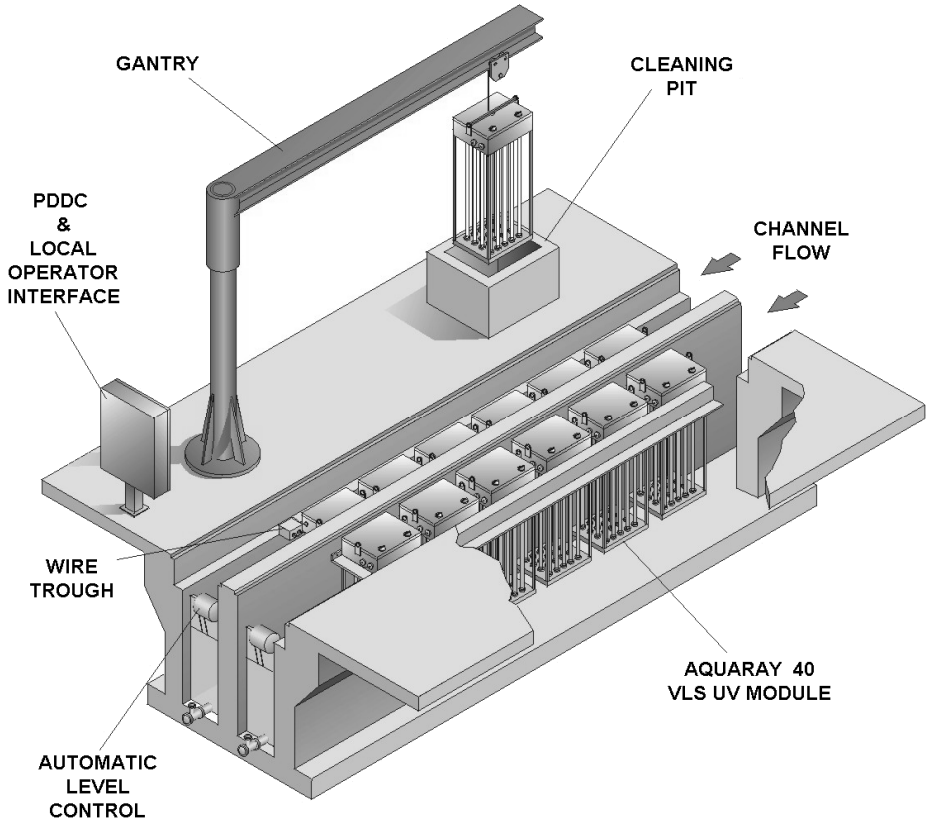


Figure 1 – Typical Aquaray® 40 VLS UV Disinfection System Layout

Table of Contents

1.0 SAFETY

! WARNING

THE FOLLOWING IMPORTANT SAFETY PRECAUTIONS MUST BE OBSERVED WHEN WORKING WITH ULTRAVIOLET DISINFECTION SYSTEMS:

WARNING

ULTRAVIOLET LIGHT WILL BURN EYES AND SKIN. WHENEVER WORKING IN CLOSE PROXIMITY TO OPERATING UV LAMPS, FOLLOW ALL SAFETY PROCEDURES OUTLINED IN THIS INSTRUCTION.

WARNING

WHENEVER WORKING ON THE LEVEL CONTROL WEIR TROUGH, FOLLOW ALL APPLICABLE SAFETY PROCEDURES FOR CONFINED SPACES.

! WARNING

HIGH VOLTAGE IS PRESENT WITHIN THE MODULE. DISCONNECT ALL ELECTRICAL POWER TO THE UV MODULE BEFORE OPENING THE COVER FOR SERVICING.

Ultraviolet light at the 253.7 nm wavelength can severely damage eyes and skin if proper safety precautions are not taken. Even very brief exposure to the eyes will cause *arc eye*, which is extremely uncomfortable and, if repeated, will cause permanent damage.

Always ensure that all supplied eye shields and warning signs are installed with the Aquaray® 40 UV Disinfection System.

The most effective approach is to simply avoid exposure to UV rays. Routine operation and maintenance of the UV disinfection system can be accomplished without exposure to UV rays, however, it is good practice to wear the supplied UV safety goggles when servicing or inspecting the equipment while it is operating.

If exposure to the UV rays cannot be avoided, then exposure must be limited to no longer than a few minutes and the following precautions must be taken:

1.1 APPROVED SAFETY GOGGLES

The proper goggles are supplied with the equipment and can be identified by the letters "UV" imprinted in the corner of the lens. The goggles must fit tightly to the face.

1.2WEAR FACE SHIELD OVER GOGGLES

The face shield is used for the facial skin protection only and must not be used as eye protection.

1.3 PROTECTIVE CLOTHING

The use of fully buttoned long sleeved shirt, long pants, and gloves are required to protect skin. Always check for openings where skin can be exposed to UV rays. The neck, exposed through an unbuttoned shirt, is a common spot of burn.

2.0 ULTRAVIOLET DISINFECTION - GENERAL

2.1 HOW DOES ULTRAVIOLET LIGHT DISINFECT WATER?

Ultraviolet (UV) light is of a shorter wavelength than visible light. Although the UV lamps produce a blue light, the UV is actually not visible to the eye. The wavelength of UV that is used for disinfection is 253.7 nm, which is the wavelength that is commonly used to render microorganisms such as bacteria and viruses harmless.

UV light does not necessarily kill the microorganisms. The light passes through the membrane of the organism and alters its DNA thus rendering the organism unable to reproduce.

This process does not alter the water other than destroying the microorganisms. Unlike chlorine treatment, which leaves a residual, UV treatment does not add chemicals to the water.

The UV disinfection equipment consists of a number of UV lamps arrayed in a flowing stream of water. The system will disinfect this water to meet the requirements of the operation standards or discharge permit. The UV system installed has been engineered to both operate at specific flow rates and treat the type of water found at this particular installation.

The two most important factors of UV disinfection are the UV transmissibility – the amount of UV light that can pass through the water and the flow rate of the water. These two factors make up the dosage of the system.

Dosage = UV Intensity × Time (microwatt-seconds)

Changing either of these factors will significantly affect the water quality discharged from the UV system. For example, if the water flows by the UV lamp too quickly, even with very clear water, disinfection will be incomplete. If the water has a low UV transmittance, even at a low flow rate, the disinfection will be considerably reduced.

2.2 ULTRAVIOLET TRANSMISSION

The effectiveness of the UV disinfection system depends largely on the intensity of the UV light reaching the microorganisms in the water being treated. This UV intensity is reduced by three major factors:

2.2.1 DISSOLVED SOLIDS THAT ABSORB UV ENERGY

Dissolved solids contained in the water will absorb UV energy before it can reach the microorganism. Since dissolved solids may not be evident (i.e., cloudy water), water may appear clear and have a very low UV transmission.

This UV transmission can only be accurately measured with a spectrophotometer capable of measuring UV at 253.7 nm. In most cases, the UV transmission has been measured prior to engineering the UV system and has been factored into the design.

2.2.2 SUSPENDED SOLIDS SHIELDING MICROORGANISMS FROM UV LIGHT

Suspended solids are also a major factor affecting UV intensity and can actually shield a microorganism from the UV light or completely encapsulate them. It is very important to regularly test the suspended solids to ensure that the design parameters are not being exceeded.

2.2.3 COATING OF QUARTZ JACKETS

The quartz jackets are long "test tubes" housing the UV lamps and protecting them from the water. Quartz is used to fabricate these jackets since plastic cannot transmit UV light at the required wavelength. During regular use, the quartz jackets will become coated with materials that reduce the UV intensity.

Depending on the installation site, the quartz jackets will become coated with various types and amounts of material. The coating is removed by two methods of cleaning; hand scrubbing the jackets with SCOTCH-BRITE™ pads and ammonia, and the mechanical cleaning plate. These two methods can be used together or separately to achieve the desired cleaning effect on the modules.

3.0 Aquaray® 40 UV DISINFECTION SYSTEM OVERVIEW

The Aquaray® 40 UV Disinfection System consists of the following major components:

- UV Modules
- Power & Data Distribution Cabinet (PDDC) - *System Control Panel* – Can be split into 2 panels, a PDC (Power Distribution Center) and DCS (Data Control System)
- UV Photosensor

3.1 DEFINITIONS

The following terms are used throughout the instructions:

DCA	Data Control Assembly – the "Brain" of the module
ELC	Electronic Lamp Controller (Ballast) – runs 2 lamps
EPROM	Electrically Programmable Read Only Memory – a computer chip loaded with an operating program
LCA	Lamp Control Assembly – device that monitors and controls one row of lamps in the module
LOI	Local Operator Interface – operator interface in the control panel
PDDC	Power & Distribution Data Cabinet - *System Control Panel* – Can be split into 2 panels, a PDC (Power Distribution Center) and DCS (Data Control System)
UV	Ultraviolet Light

3.2 UV MODULE

The UV module is the core of the Aquaray® 40 UV Disinfection System. The UV module contains the UV lamps and ballasts as well as electrical components for the monitoring, control, and data storage of the disinfection process. The self-supporting module is placed into the effluent channel for operation.

The ultraviolet mercury arc lamp that emits light at the 253.7 nm wavelength (generally referred to as 254 nm). The lamps are also referred to as germicidal lamps.

The UV lamps have a limited life span. This is due primarily to solarization – when the mercury inside the lamp begins to "plate" the inside of the lamp over time, thereby reducing the effective output of the lamp.

Power and data are transmitted to the UV module using individual connectors. The power and data cables are terminated in the PDDC.

3.3 POWER & DATA DISTRIBUTION CABINET

Although the UV module can operate as a stand-alone unit, external power and data/control panels are necessary to properly control and monitor its functions. The system is provided with either a panel combining power distribution and data/control functions (PDDC – Power and Data Distribution Center) or two separate panels (PDC – Power Distribution Center and DCC – Data Control Center).

To distribute power to the modules, the panel(s) include load centers containing a main circuit breaker, individual circuit breakers for each module, and a common circuit breaker for the control instruments.

Mounted on the door of the control panel is the Local Operator Interface (LOI). The LOI permits the user to monitor and control features of the system when at the UV channel.

3.4 PHOTOSENSOR

A very important feature of the UV disinfection system is the photosensor. This device is used to monitor the intensity of UV light being transmitted to the water being treated. This device is a very specific sensor that measures only the light in the 254 nm wavelength.

The photosensor provides a reading that is representative of all lamps within this module or installation.

The UV intensity displayed on the bar graph is affected by any or all of the following conditions:

- ❑ Reduced UV output from the lamp due to age.
- ❑ Reduced transmission of the effluent.
- ❑ Reduced UV transmission through the quartz jacket due to coating or fouling.

3.5 LEVEL CONTROL DEVICE

The level control device is an important part of the UV disinfection system. The Effluent Level Control accommodates flow fluctuations and maintains a constant level in the channels. If the effluent level rises above the height of the UV lamp, disinfection will not be complete in this area. If the effluent level drops too far below the effective arc of the lamp, the system will not operate efficiently. The level of the effluent is maintained between 57.5” and 62” from the bottom of channel elevation for all flow rates, head loss and level control variations are taken into account when designing the channel.

3.5.1 FIXED WEIR LEVEL CONTROL

The fixed weir level control consists of a serpentine fixed weir, the serpentine assembly should be grouted in place and caulked to seal them following installation. The weir should be installed in accordance with the drawings and the weir plates must be adjusted to the level shown on the layout drawings.

3.6 MODULE CLEANING

There are several methods used to clean the quartz jackets;, integral jacket wiping/cleaning plate, and manually, a Clean quartz jackets are essential for the efficient and effective operation of the Aquaray® 40 UV Disinfection System.

The system is equipped with an integral sleeve wiping mechanism built into each module. Further description of each of these cleaning options follow.

3.6.1 INTEGRAL CLEANING SYSTEM WITH WIPERS (OPTIONAL)

The wiper system developed by ONA provides the modules with a self-cleaning system. This wiper system will not replace manual cleaning of the Aquaray 40, but it will help in the day to day maintenance of the system and allow fewer manual cleanings of the module.

The wiper system consists of a metal plate that holds 40 cleaning units. This wiper plate parks above the water level of the channel so it does not block UV light from the disinfection process. Once or twice a day (contract specific) the cleaning cycle will be initiated by the controls and the plate will travel down to the bottom of the module, and return to the top of the module. This cycle is designed to clear the quartz jackets of material that may accumulate on the exterior of the jacket.

4.0 INITIAL STARTUP

4.1 GENERAL

The UV modules must be installed under the supervision of or after inspection by an ONA engineer. The channel must be free of dust, debris, and water. The channel and all upstream piping should be flushed with clean water prior to installation of the modules.

After installation of the UV modules, the channel must be filled slowly to prevent damage to the quartz jackets. The channel should be filled with clean water or effluent that is within the parameters of the specifications.

Ensure that all power and data cables are properly connected and free of damage.

4.2 BRINGING UV MODULES ON LINE

The following is a systematic and orderly procedure for startup of the Aquaray®40 UV Disinfection System. The user will manually control the modules from the LOI and turn on each module individually from the panel, one at a time. As each module is successively tested, the user will deselect the rows that have been tested manually from the LOI. The next module will then be turned on at the circuit breaker and tested.

1. Verify that all circuit breakers within the panel are switched to the off position.
2. Switch on the MAIN and CONTROL circuit breakers and view the LOI screen.
3. Note that on systems with more than one module across the channel, all of the modules in this "bank" will be activated simultaneously by the LOI. However, each module has a circuit breaker that must be operated individually.

4. Allow five (5) minutes for the module to fully stabilize before polling for status, if the module is polled immediately, erroneous alarms may be indicated since the system is still " booting up" and has not fully stabilized.

5. Once the module is started up and the module has been polled, refer to the TROUBLESHOOTING Section of this instruction. If all conditions are *GOOD*, then select the MAIN Screen.

6. Repeat these steps until all UV modules have been tested.

5.0 NORMAL OPERATION

5.1 GENERAL

The Aquaray® 40 UV Disinfection System must be operating whenever water is flowing through the channel. Any interruption of operation will result in loss of disinfection. Normally the system should be operated in the automatic mode, which will maintain the appropriate number of lamps necessary to fully disinfect at fluctuating flow rates.

During periodic maintenance it may be necessary to remove operating modules from service. Before removing the module from operation ensure that an additional module is manually turned on to compensate for the module being serviced. This is best done by operating the modules in Manual Mode.

The Aquaray® 40 UV Disinfection System is fully automatic. After performing the initial start-up procedure the system will require limited attention from the user.

5.2 AUTOMATIC FLOW PACING

The Aquaray® 40 UV Disinfection System is fully automatic and will maintain the proper UV dosage necessary for disinfection at various flow rates. This is achieved by "flow pacing" – varying the number of lamp rows operating in proportion to the flow rate. The flow rate is transmitted to the UV system via a 4-20 mA signal from the plant flow meter.

The disinfection process requires exposure time of only several seconds. At low flow rates, this exposure is accomplished in a relatively short area on the downstream end of the channel. As the flow rate increases, more rows of lamps across the channel are activated to maintain the required dosage. Significant savings are realized and maintenance is reduced by optimizing the number of lamps operating at any time.

Note that during flow pacing, once a row is turned on, it will remain on for a programmed minimum run time. This will occur even if the flow rate decreases.

5.3 COLD WEATHER OPERATION

When the Aquaray® 40 UV Disinfection System is operated in sub-freezing ambient temperatures, care must be taken to prevent damage to the quartz jackets and UV lamps from snow and ice accumulation in the channel.

Always ensure that the power to the control panel remains "on" and that the heater in the control panel is "on".

With effluent flowing, the system is capable of operating in temperatures below freezing. However, when the effluent flow is stopped, freezing can occur and could

possibly damage the UV lamps. Damage resulting from freezing is not covered by warranty.

To prevent damage from freezing:

- ❑ Never leave water in channel without flow.
- ❑ To prevent water accumulation always keep drains open in empty channels.
- ❑ Never let accumulated snow stay on top of the module.

Should ice or snow accumulate:

- ❑ To avoid damage to the lamps and quartz jackets do not move modules.
- ❑ Open drains and begin to run service water into channel with the UV lamps operating.
- ❑ After all ice or snow accumulation has thawed and channel has drained, turn off water and allow lamps to operate until dry.
- ❑ Remove modules and inspect thoroughly for cracked or broken quartz jackets.
- ❑ Return to service with effluent flowing or place into dry storage.

5.4 PERIODIC MAINTENANCE

5.4.1 MODULE COOLING FAN

Each module has a cooling fan operating continuously whenever the module circuit breaker is activated. It is very important to keep the fan and shrouds free of debris to prevent UV module overheating.

On a weekly basis, or whenever cleaning the module, the fan grill must be cleaned of debris. Forced air or a soft brush will remove most of the debris

Should the cooling fan fail to operate, immediately inspect the fan for blockage. The fan shroud can be removed to access the fan, ensure that all electrical connections to the fan are intact, and inspect the fan housing for blockage (dirt, bugs, grass clippings, etc.) – remove blockage, verify power connections, reinstall the shroud and re-apply power. If the fan still does not work, replace the fan before leaving the module running for extended periods of time (more than a day) to avoid over heating. It is suggested that the affected module be swapped to a module position further upstream so that it will not be needed for disinfection purposes except under high flow conditions, until the fan can be replaced.

5.4.2MAINTENANCE SCHEDULE

Daily	Check operator interface for operating conditions and alarms. Address any alarm conditions, ensure that any factors contributing to alarm conditions are addressed (for instance, a broken quartz jacket can cause a lamp to fail)
	Check effluent level – needs to be between 57.5” & 62” for all operating modules
	Visually inspect the modules for any abnormal conditions.
	Run wipers at least once per day.
Weekly	Clear any debris from module fan grills. Ensure that all fans are running and there is no blockage of cooling air flow.
	Check channel for build up of solids or algae, clean as required. Large mats of algae can affect headloss through the channel by blocking the flow of water, and can lead to broken jackets if the mat is large enough, ensure that algae mats are not allowed to build up on the modules. Cleaning of equipment (such as clarifiers) upstream of the UV system can send large clumps of algae to the UV channel, take care to keep such clumps out of the UV channel.
Monthly	Open modules and inspect the interior for signs of abnormal conditions. Ensure that all gaskets on the lid are in good condition and that all latches properly seal. Inspect condition of power and data connections to the module.
	Verify lamp operating hours. Lamps will continue to operate after their disinfection effectiveness has decreased below the design level, lamps which have been in operation for more than 13,000 hours (about a year and a half) should be replaced. It is a good practice to change all lamps in a module at the same time.

5.5 NORMAL SHUT DOWN PROCEDURE

Before shutting down the equipment, stop flow through the channel. Disinfection will cease if flow is allowed to continue through the channel with the equipment off. Also, ensure that there are no broken quartz jackets that could damage modules by allowing water to enter the enclosure.

5.5.1 SHORT DURATION SHUTDOWN

For inactivation of one day to one week, open the control panel door and locate the load center(s). On the load center(s), locate the main disconnect breaker and turn off the breaker using the disconnect switch.

5.5.2 LONG DURATION SHUTDOWN

For inactivation lasting more than one week, turn off the system as in the short duration inactivation procedure. Additionally, silica gel-based desiccant must be placed inside the control panel and in each module (ensure desiccant bag is properly sized for enclosure). Desiccant must be replaced at minimum every 3 months. Drain the channel to prevent possible septic conditions and freezing during winter conditions. Verify that all ancillary equipment are adequately lubricated and preserved during the extended shutdown condition. Refer to specific shutdown/storage instructions for hoist, blower, etc. When placing equipment back into service, inspect the modules for damage (especially broken jackets) and ensure that all power and data connections are securely mated.

5.6 EMERGENCY SHUT DOWN PROCEDURE

Disconnect power at the main circuit breaker in the control panel to completely shut down the Aquaray® 40 UV Disinfection System. Note that this will cause all UV modules to be OFF, therefore, the effluent stream WILL NOT be disinfected. If shutdown lasts more than 1 week, refer to the long duration shutdown procedures.

5.7 EMERGENCY OPERATING PROCEDURE

Ensure that all circuit breakers are ON. The UV modules can be operated manually in HAND mode, refer to LOI instructions.

6.0 TROUBLESHOOTING

Troubleshooting of the Aquaray® 40 UV Disinfection System has been designed for simplicity. All of the alarm conditions can be identified and corrected by process of elimination. All of the user accessible components have been furnished with quick disconnect plugs and will require only simple hand tools for access.

> ! **WARNING**
>
> HIGH VOLTAGE IS PRESENT WITHIN THE MODULE. DISCONNECT ALL ELECTRICAL POWER TO THE UV MODULE BEFORE OPENING THE COVER FOR SERVICING.

6.1 TRIPPING CIRCUIT BREAKER

The best way to locate the cause for tripping circuit breakers is by the process of elimination. The following procedure is recommended:

1. Disconnect the module power connector from the power cable. Test the circuit breaker. If the circuit breaker trips, then check the external connector and cable for shorts or the presence water inside the external connector. If the circuit breaker does not trip, then proceed to Step 2.
2. Open the module and disconnect the power harness from all Lamp Control Assemblies (LCA), the Data Control Assembly (DCA), and the fan. Reconnect the external power connector and test the circuit breaker. If the circuit breaker trips, then check all internal power wiring for shorts or damage. If the circuit breaker does not trip, then proceed to Step 3.
3. Reconnect the fan. Close the module lid and test the circuit breaker. If the circuit breaker trips then check the fan wiring and replace the fan if necessary. If the circuit breaker does not trip, then proceed to Step 4.
4. Reconnect the DCA. Close the module lid and test the circuit breaker. If the circuit breaker trips then check the DCA wiring and replace the DCA if necessary. If the circuit breaker does not trip, then proceed to Step 5.
5. Reconnect one LCA's power connector. Close the module lid and test the circuit breaker. If the circuit breaker trips then proceed to Step 6. If the circuit breaker does not trip, then reconnect another LCA, close the module lid, and test the circuit breaker again. If the circuit breaker trips then proceed to Step 6. Continue reconnecting and testing LCA's until the faulty LCA is located.
6. This step assumes that one LCA has been confirmed to trip the circuit breaker. If all other tests have not located the fault, the last items to check are the ballasts. Once the LCA with the fault is located, disconnect all four ballasts from that LCA and test the circuit breaker, then plug in one at a time. Successively reconnect the ballasts until the circuit breaker trips, then replace the faulty ballast.

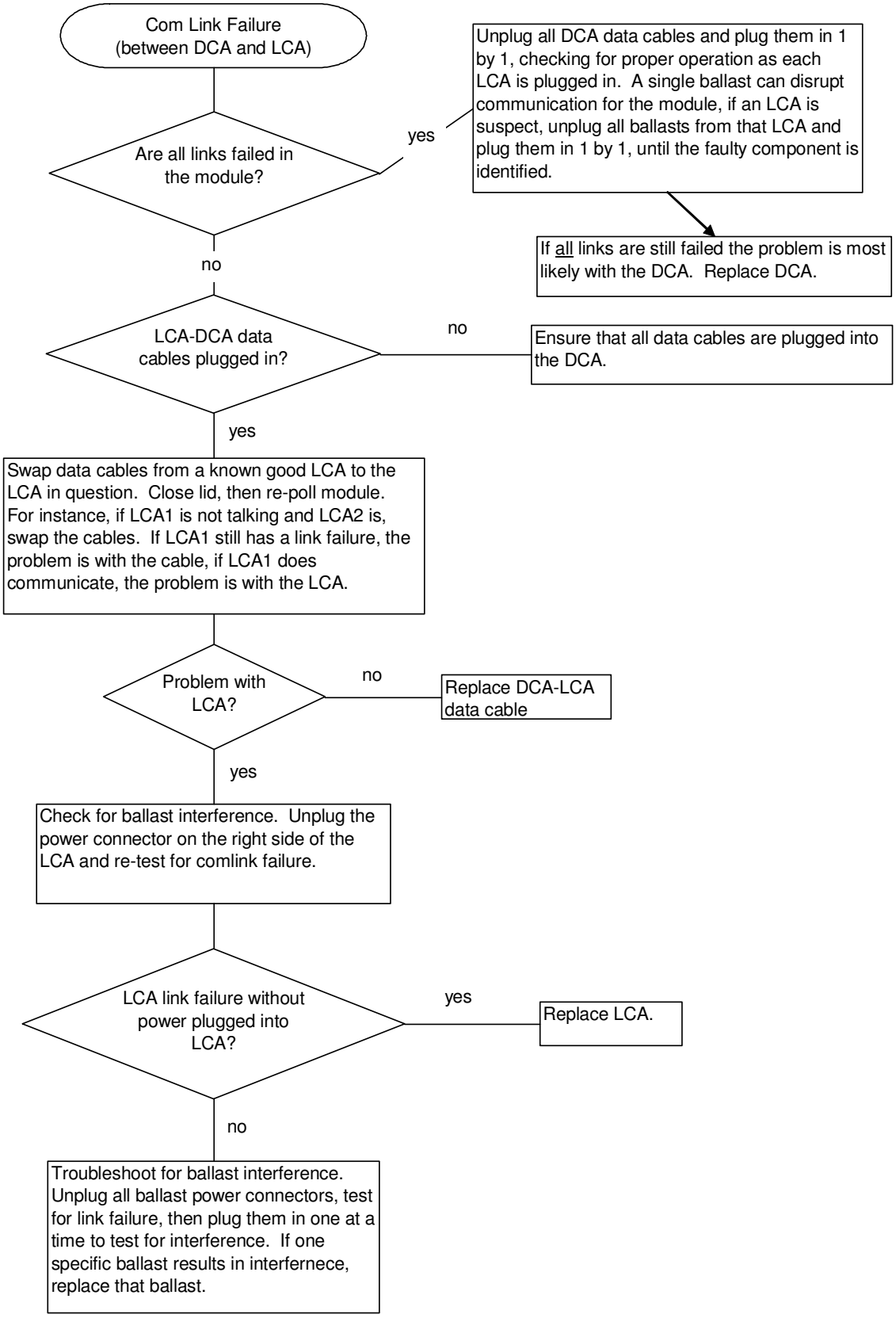
6.2 COMMUNICATIONS / LINK FAILURE

There are 2 types of communication failure, a com failure between the LOI and module and a link failure within the module. Note that if a communications failure exists and there is power to the UV module, then the module will automatically turn ON. This is a design feature intended to ensure that disinfection is maintained.

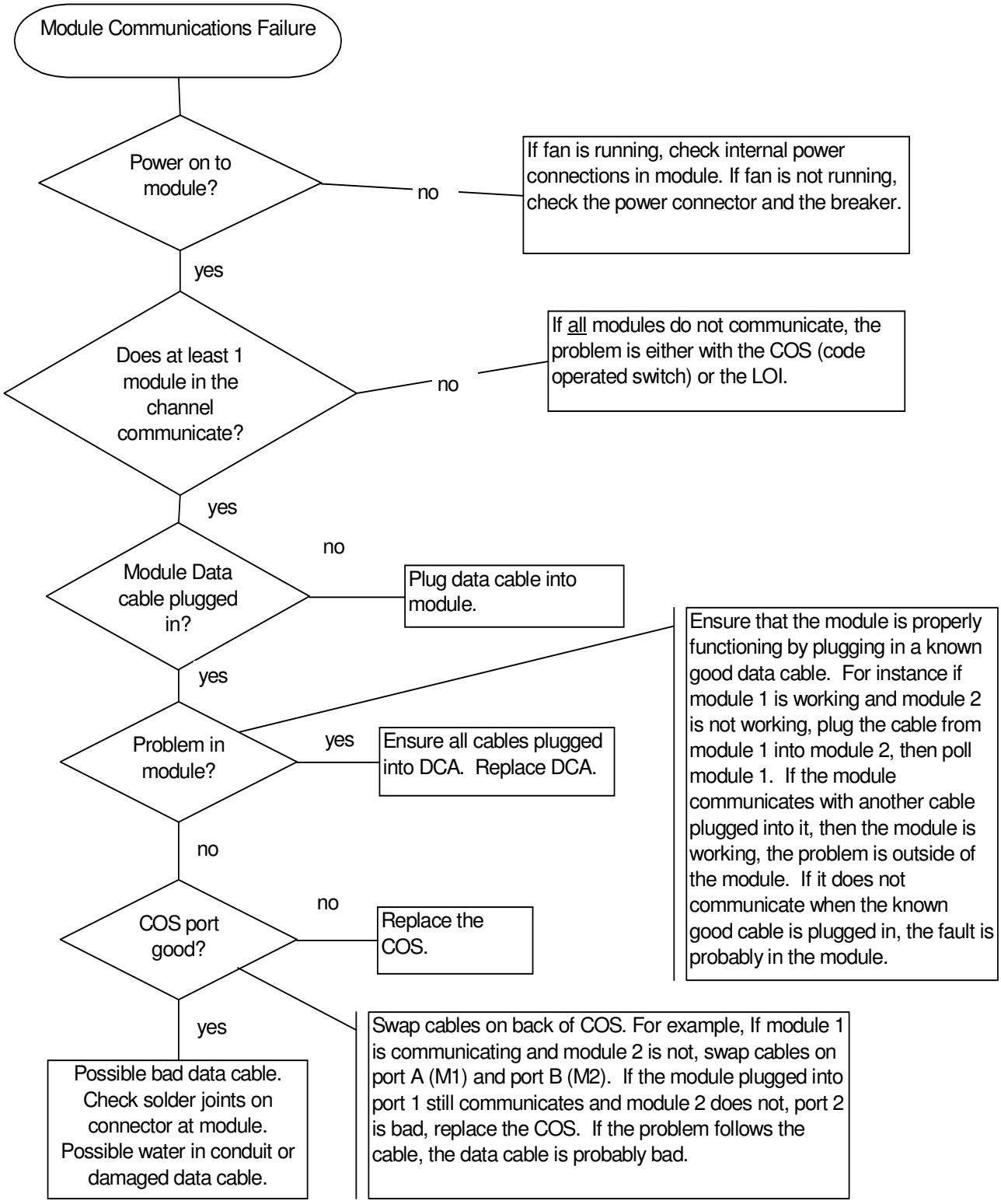
LCDs mounted on the LCA and DCA are provided to assist in troubleshooting. Safety switches may have to be over-ridden to provide power to the components to test them under powered conditions. Goggles and face masks must be worn if power is applied

to the module with the lid opened, ensure that precautions are taken to avoid the electrical hazard when the lid switch is over-ridden. The following table details the LCD status indications.

DATA CONTROL ASSEMBLY (DCA)	
LED	**SIGNAL**
DS1 - Power Supply	Steady = OK
DS2 - Master Cycle	Blinking = OK
DS3 - Data Communications	Blinking = OK
DS4 - Data Communications	Only blinks when data
LAMP CONTROL ASSEMBLY (LCA)	
LED	**SIGNAL**
DS1 - Power Supply	Steady = OK
DS2 - Master Cycle	Blinking = OK
DS3 - Data Communications	Blinking = OK
DS4 - Lamp Status	BLINKING RATE: Steady = Lamps ON 1/sec = Preheat 5/sec = Timing ON/OFF or



CHECKED: LC. 4/23/2012	TITLE: AQUARAY® 40 HO PRELIMINARY O&M INSTRUCTIONS			SHT: 16 of 27
APPROVED: JN	OZONIA NORTH AMERICA 600 WILLOW TREE ROAD LEONIA, NJ 07605	A	DWG No. 18253-77-0057	REV: A



CHECKED: LC. 4/23/2012	TITLE: AQUARAY® 40 HO PRELIMINARY O&M INSTRUCTIONS			SHT: 17 of 27
APPROVED: JN	OZONIA NORTH AMERICA 600 WILLOW TREE ROAD LEONIA, NJ 07605	A	DWG No. 18253-77-0057	REV: A

6.3 LAMP FAILURE

(See following troubleshooting chart for lamp/ballast failure)

A UV lamp can be out as a result of a failed lamp, failed ballast, or failed LCA. The first step is to ensure that the lamp is actually failed. A questionable lamp can be swapped with an adjacent “known good” lamp to test for lamp operation. If the known good lamp works in the position that the failed lamp was plugged in to, the lamp should be replaced. Note that if two lamps directly adjacent to each other are failed, the problem is most likely with the ballast (see below). To replace a failed lamp, refer to the UV LAMP REPLACEMENT Section of this instruction. Once the lamp has been changed, re-poll the affected module after 15 minutes and confirm that the failure has been corrected. Reset the hours of the lamp whenever you replace a lamp. If the new lamp does not light, then check the lamp connector, pins, and wires for loose connections and correct as necessary.

6.4 BALLAST FAILURE

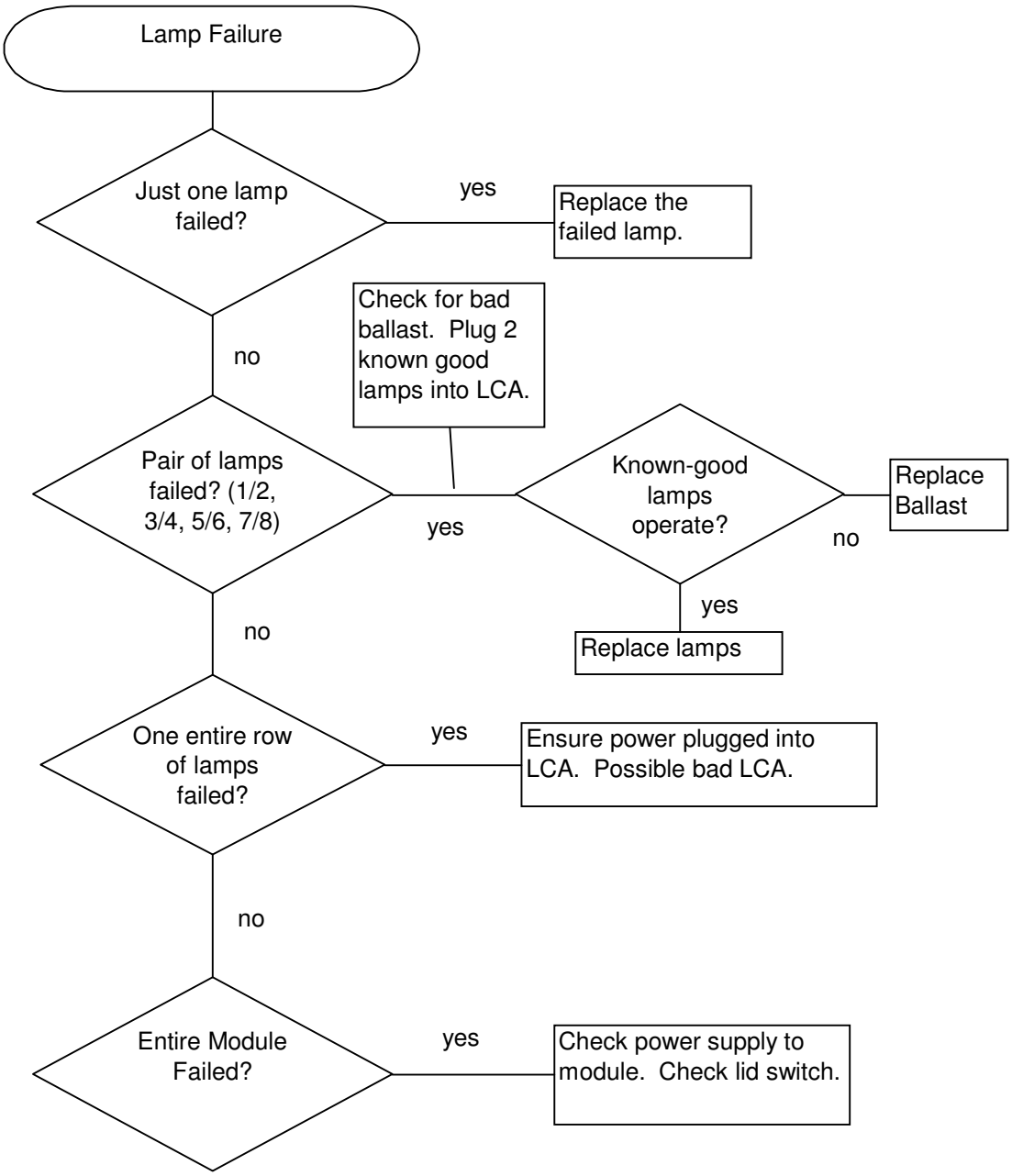
(See following troubleshooting chart for lamp/ballast failure)

Four ballasts operate one row of lamps, for a total of eight lamps. Each ballast operates two adjacent UV lamps. The ballasts are located around the perimeter of the module and are connected to the LCA.

1. To access ballast, turn off power to the module.
2. Open the lid of the module and locate the row (LCA) that has the ELC failure.
3. Ballast No. 1 operates Lamp No. 1 and Lamp No. 2, Ballast No. 2 operates Lamp No. 3 and Lamp No. 4, etc.
4. To replace ballast, trace the wire back to the ballast and unplug the connector at the ballast.
5. Remove the nut and washer and lift the ballast out of the module.
6. Install the new ballast, ensuring to fully engage the ballast into the bracket at the bottom of the module enclosure. Follow the ballast installation procedure located in this instruction – heat transfer compound MUST be applied to the ballast before installation.
7. Close the lid and turn on the circuit breaker.
8. Poll the module to ensure that the failure condition has been corrected.

6.5 LAMPS WILL NOT GO OFF

If the lamps continue to run when they are not required, the relay in the LCA is most likely damaged. The LCA should be replaced in this case.



CHECKED: LC. 4/23/2012	TITLE: AQUARAY® 40 HO PRELIMINARY O&M INSTRUCTIONS			SHT: 19 of 27
APPROVED: JN	OZONIA NORTH AMERICA 600 WILLOW TREE ROAD LEONIA, NJ 07605	A	DWG No. 18253-77-0057	REV: A

6.6 UV INTENSITY FAILURE

If there is an intensity failure condition, then the user must determine the cause of the FAILURE condition:

- How many hours have the lamps been operating? If the current lamps have been operating for more than 10000 hours, then replace the lamps.
- What is the transmission of the effluent? The effluent should have a T10 UV transmission of approximately 65 percent or higher, this is the normal UVT of wastewater being treated. If the transmission is low, there may be a process problem upstream of the UV system that must be corrected.

If it is determined that both of the above conditions are not the cause of the INTENSITY FAILURE condition then it can be assumed that the quartz jackets are coated and must be cleaned. This is the most common condition associated with an INTENSITY FAILURE condition, and with experience, it can be anticipated so maintenance can be scheduled. See the separate intensity monitor instruction for more detailed troubleshooting information regarding the intensity monitor.

6.7 TEMPERATURE FAILURE

The temperature alarm indicates that the module is not receiving adequate cooling. If the over-temperature condition persists, the module can be damaged. Normally, over-temperature conditions are caused by debris blocking the fan.

7.0 MODULE REMOVAL AND REPLACEMENT

For service other than routine lamp and ballast replacement, the UV module must be removed from the channel.

The UV modules are moved only with the jib crane, hoist, and spreader bar supplied with the UV system. Users must be familiar with the lifting equipment and must follow all applicable rules regarding their use.

! WARNING

MODULES ARE TOP HEAVY. THEY MUST ONLY BE PLACED ON A LEVEL, FLAT SURFACE. NEVER LEAN MODULE.

! WARNING

DO NOT STAND UNDER OR LIFT MODULES OVER PEOPLE. DO NOT LEAVE MODULE SUSPENDED FROM CRANE UNATTENDED. DO NOT LEAVE HOIST CONNECTED TO MODULE WHEN UNATTENDED.

! WARNING

EXPOSURE TO ULTRAVIOLET RADIATION CAN BURN EYES AND SKIN. PROTECT EYES AND FACE WITH SAFETY GOGGLES AND FACE SHIELD DESIGNED TO PROVIDE PROTECTION FROM 253.7 NM WAVELENGTH UV RADIATION

Two people are required to move modules – one to operate the hoist and one to steady and position the module.

Before removing the module from operation, ensure that an additional module is manually turned on to compensate for the module being serviced. Refer to the LOI instructions for manual operation of modules.

1. Disconnect power from the UV module by turning off the associated circuit breaker in the PDDC. Disconnecting the power cables before turning off the power will damage the circuitry, and is a hazard to personnel.

2. Disconnect the power and data cables from the UV module.

3. Secure the cables to prevent them from falling into the channel and being caught on the module during removal and replacement.

4. Position the jib crane and hoist directly above the UV module to be removed. Attach the spreader bar to the hoist and to the two lifting eyes of the UV module.

5. Raise the module until the base is above the water level but still below the eyeshields and allow the module pan to drain.

6. Carefully move the module to the service area.

7. Always remove the hoist from the module and secure it. The jib crane may be inadvertently moved resulting in damage to the UV module or personnel injury.

8. When installing the module into the channel, ensure that the cables do not get pinched by the UV module. Ensure that the UV module is level before disconnecting the hoist.

9. Reconnect the cables to the UV module.

8.0 UV LAMP REPLACEMENT

Before removing the module from operation, ensure that an additional module is manually turned on to compensate for the module being serviced. Refer to the LOI instructions for manual operation.

1. Disconnect power to the module by turning off the associated circuit breaker in the PDDC.
2. Open the lid of the module enclosure.
3. Locate the lamp by row number (row 1 is closest to fan) and lamp number alongside the lamp socket.
4. Unplug the lamp from the socket on the LCA by squeezing the tabs on the lamp plug and pulling.
5. Remove the lamp from the jacket by pulling the lamp by the wire straight up and out of the jacket. (reference following drawing)
6. Remove the two spacer clips from the lamp and transfer them onto the new lamp.
7. Carefully install the new lamp into the jacket. Ensure that the lamp is pushed all the way to the bottom of the jacket. Use care when handling the new lamp to prevent fingerprints.
8. Plug the lamp into the socket on the LCA.
9. Close the module lid and secure all latches.
10. Turn on the associated circuit breaker.
11. Monitor operation and record the operating hours of the lamp. Refer to the LOI DESCRIPTION Section of this instruction.
12. Discard a UV lamp as one would a standard fluorescent lamp.

9.0 QUARTZ JACKET REPLACEMENT

Quartz jacket replacement is required only when the jacket has been physically damaged. The UV module should be removed from the channel for this operation.

1. Remove the module from the channel as per the MODULE REMOVAL Section of this instruction.

2. Remove the UV lamp from the jacket being replaced in accordance with the UV LAMP REPLACEMENT Section of this instruction. If the lamp is intact, clean the lamp with a household glass cleaner and allow it to dry thoroughly. Replace the lamp if it is broken.

3. Remove the jacket by lifting straight up through the gland nipple. The jacket is not secured in the bottom pan of the module.

4. Inspect the jacket-sealing ring to ensure that it is not damaged. If it is damaged, remove it and replace with a new seal. The new seal can be lubricated with glycerin or soap and water to ease installation. Ensure that the new seal is thoroughly seated.

5. Insert the new jacket straight down through the seal in the module enclosure and insert the test tube end into the grommet in the bottom pan. Put a dab of silicone caulking at the top of the jacket once it is in place.

6. Replace the UV lamp into the jacket as described in the UV LAMP REPLACEMENT Section of this instruction.

7. Replace the module into channel as described in the MODULE REMOVAL Section of this instruction.

10.0 BALLAST REPLACEMENT

Each Ballast operates 2 lamps. Refer to the “lamp failure” troubleshooting section to verify whether it is a ballast or lamp which is failed. Note that the ballast nuts are 1/-28, the other nuts in the module are ¼-20, they are not interchangeable and will cross-thread. If a ballast needs to be changed:

1. Turn off power to the module.
2. Open the lid.
3. Unplug the ballast, there is either a plug in the top of the ballast or a pigtail which plugs into the LCA harness.
4. Remove retaining nut from stud at the top of the ballast, lean the ballast away from the side of the module and lift the ballast up. heat transfer compound may hold the ballast to the wall of the module, if this is the case lightly pry the ballast from the side of the module taking care not to damage the ballast or module.
5. Apply a film of Novagard G641 heat transfer compound on the back of the ballast (non labled mounting side) using a serrated trowel/spreader. First run a 1/4" serration fully covering the surface from end to end. Then using a 1/8" Serration start 5" from each end going from mid ballast outward in order to thin the thickness of compound to 1/8". This will leave a 3" long section in the middle at 1/4" thickness, and 1/8” thickness on either end.
6. Use a trowel with "v" grooves cut into the blade to remove the excess grease, making sure that the area in the center is thicker.
7. Install the ballast by first placing the bottom mounting slot over the mounting clip located on the bottom of the module. DO NOT ADJUST THE BOTTOM CLIP, IT IS PRE-TORQUED TO PROVIDE A SET AMOUNT OF FORCE TO THE BOTTOM OF THE BALLAST.
8. Tighten the bolt at the top of the ballast but leave a gap of about 1/16" between ballast and heat sink.
9. After approximately 15 minutes finish tightening the nut at the top of the ballast. Make sure that the ballast is firmly pressed against the side of the module. The two step tightening of the ballast top nut allows the highly viscous G641 heat transfer compound to spread out and settle. There should be an “ooze” of compound from the sides of the ballast.

Contract:	Date:	Channel:	Module:

ROW 1								
Arc								
Hours								
Cycles								
ROW 2								
Arc								
Hours								
Cycles								
ROW 3								
Arc								
Hours								
Cycles								
ROW 4								
Arc								
Hours								
Cycles								
ROW 5								
Arc								
Hours								
Cycles								

CHECKED: LC. 4/23/2012	TITLE: AQUARAY® 40 HO PRELIMINARY O&M INSTRUCTIONS			SHT: 26 of 27
APPROVED: JN	OZONIA NORTH AMERICA 600 WILLOW TREE ROAD LEONIA, NJ 07605	A	DWG No. 18253-77-0057	REV: A

MODULE STATUS RECORD

LOI-DCA Communication			
DCA-LCA Communication			
Lamps/ELC			

UV Intensity			
Temperature			
Battery (B System Only)			

G = GOOD, F = FAILED, X = Not Transmitted

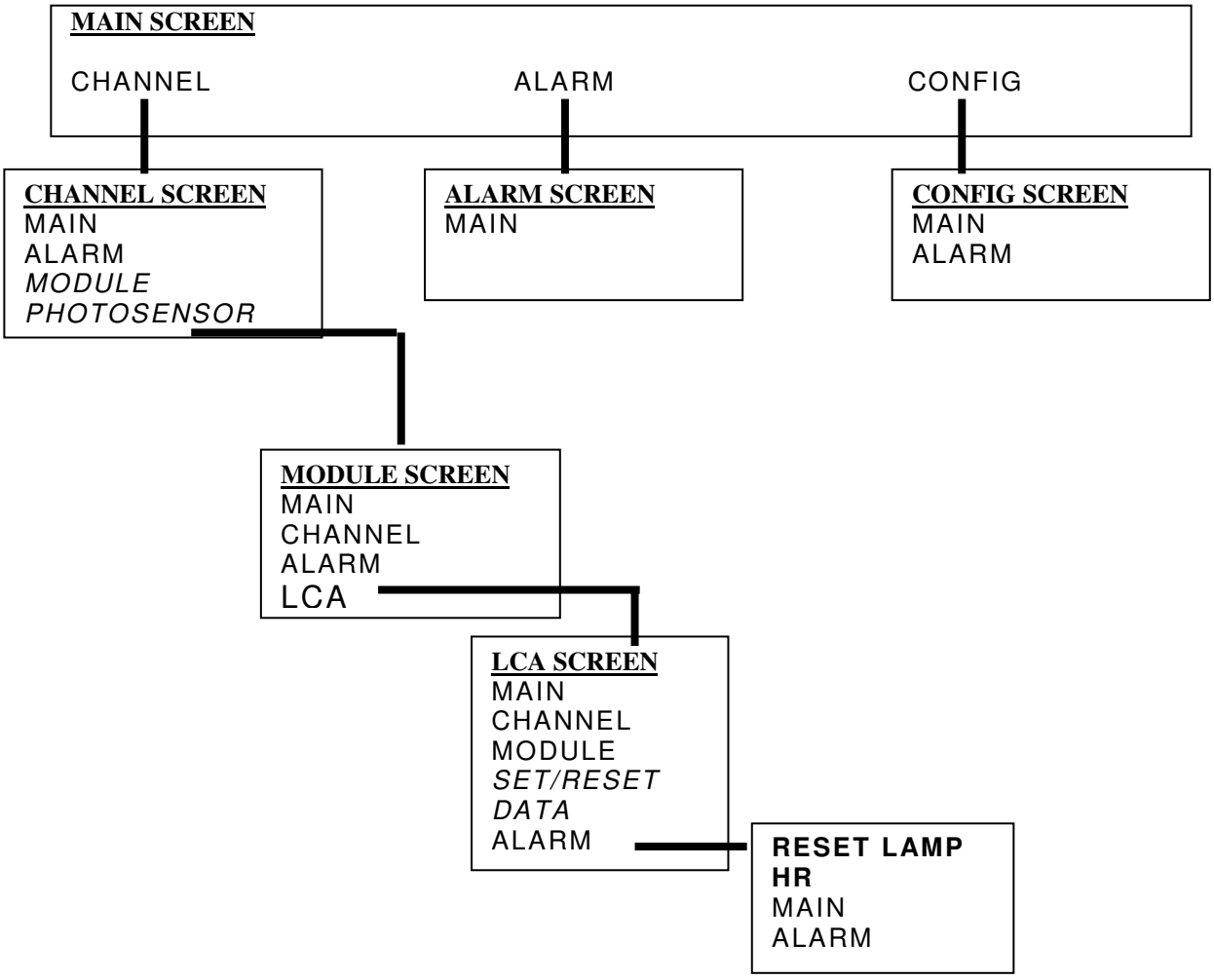
AQUARAY® 40 VLS UV DISINFECTION SYSTEM
PLC BASED LOCAL OPERATOR INTERFACE
OPERATING INSTRUCTIONS

1.0 GENERAL

The Aquaray® 40 PLC based LOI (Local Operator Interface) features a dedicated Allen Bradley PLC with color touch screen interface to provide the operator full control over all functions of the Aquaray® 40 VLS UV Disinfection System. The system incorporates flow pacing, the automatic control of UV lamps in response to plant flow. This feature can be disabled allowing manual control of the number of lamp rows activated.

2.0MENU FLOW CHART

The screens are arranged in a menu structure as outlined below.



3.0 SCREEN DESCRIPTIONS

The following typical screens detail the operation of the PLC-based control system. The modules are constantly polled by the PLC, updating the data displayed by the PLC. If the touchscreen is not activated for several minutes, it automatically is placed in "sleep" mode, simply touch any part of the screen to activate the display. Note that the alarm banner is displayed for each individual alarm; the control system cannot be accessed until the alarm banners are cleared by selecting "OK" on the alarm banner.

Note: These screens are TYPICAL for UV controls with PLC-based Local Operator Interface. The actual screens provided for a specific installation may differ slightly.

PASSWORD-PROTECTED SCREENS

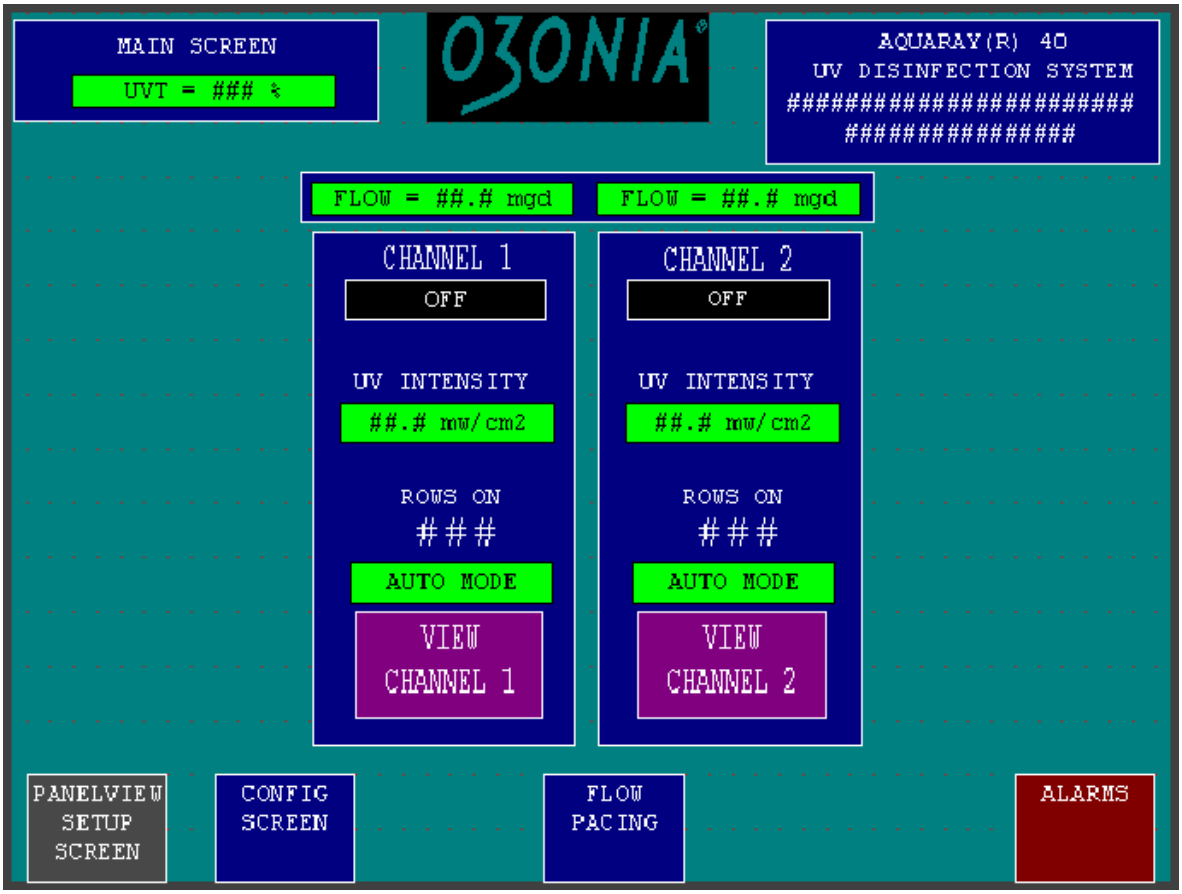
There are several screens which are password protected. These are screens that enable the user to alter key operational data or setpoints, and are protected to ensure that key settings are not inadvertently changed. Generally, the screens marked "RESTRICTED" are the password protected screens.

PANEL HEATER

The power to the panel should always be "on" and the panel heater should always be energized, even if the system is not in use.

TOUCH SCREEN NOTE

The Panelview is a touch screen display. Do not use pens or other objects to press the screen, damage may result. Only use your fingers to select items on the screen.

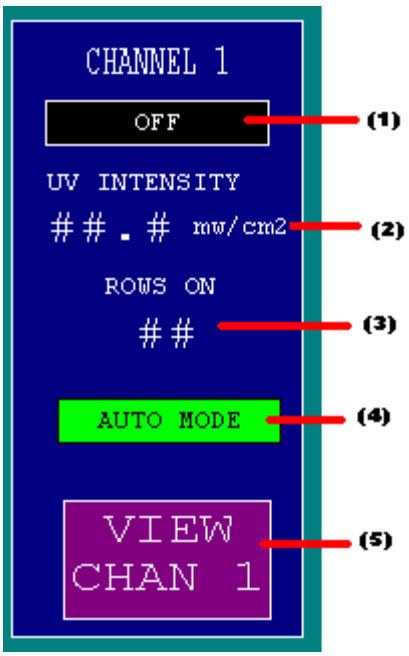


3.1 MAIN SCREEN

The main screen displays an overview of the system status. The following options are accessible:

- CONFIG SCREEN accesses the CONFIGURATION screen.
- SETUP SCREEN accesses the Allen Bradley Display setup screen.
- ALARMS accesses the ALARM screen.
- FLOW PACE COEFFICIENT is displayed, by selecting this option the flow pace coefficient can be changed. The range is 50%-150%, values below 100% cause more lamps to come on, values above 100% cause fewer lamps to come on, when compared to design conditions.

Each channel is represented by an information box, which displays channel status (this is a sample screen, job-specific screens may vary slightly)



(1) Channel operation mode. The channel operation mode is shown, either OFF or ON.

(2) UV INTENSITY. The UV Intensity is displayed in W/cm2 (SWW1 Sensor). This value is the reading from module 1 if only one sensor is installed, or a weighted average of all sensors if multiple sensors are installed. Note that the intensity alarm is based on the photosensor reading displayed on this screen.

(3) ROWS ON. Displays the number of rows which are currently in operation. This does not include rows that are on but timing out (not required) due to minimum run timers.

(4) MODE. Displays current mode, either AUTO or MANUAL.

(5) VIEW CHANNEL button, displays the CHANNEL screen.

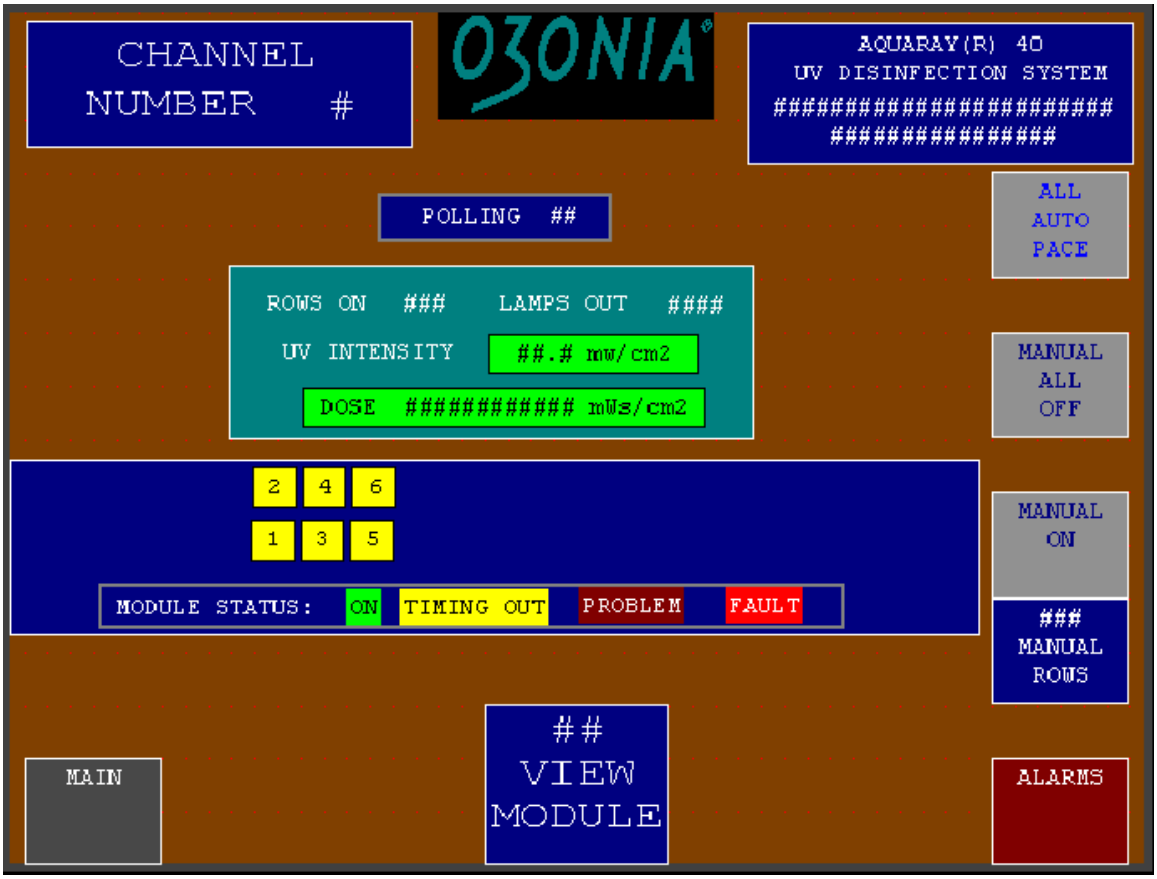
Other data may be displayed, depending on the site-specific requirements. Typical items include:

Gate Control: gate status will be displayed, including alarm status, water depth, active/inactive channels, lead/lag settings, and gate status (open/closed).

Dose: the applied dose can be displayed if sufficient monitoring equipment is provided and connected to the PLC.

UVT: The UV Transmittance as measured by the UV Transmittance Analyzer is displayed, if the system is provided with this option.

Note that these are optional features which will only be displayed if provided.



3.2 CHANNEL SCREEN

The channel screen displays an overview of the channel status. The following options are accessible:

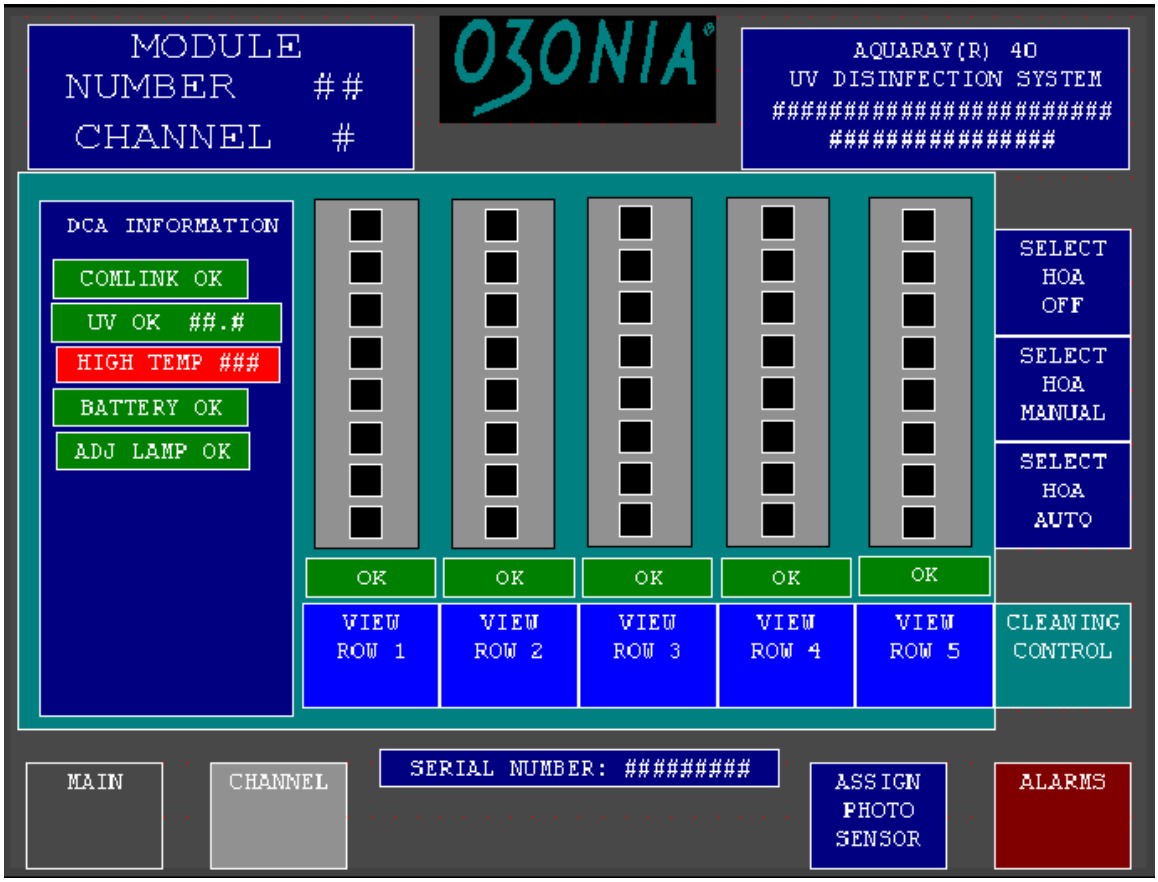
- MAIN returns to MAIN screen.
- ALARMS accesses the ALARM screen.
- MODULE # buttons access the MODULE screen for the module selected. The button also displays the status (ON/OFF/ALARM) of the module. ON indicates that at least one row is called for and operating in the subject module. OFF indicates that the module is not called for to be on. ALARM indicates that there is an alarm condition present.
- The operator can select global manual or automatic operation for the specific channel from this screen using the buttons labeled as follows:
  - ♦ ALL AUTO PACE causes all modules to be automatically flow paced. **This is the normal mode of operation.**
  - ♦ MANUAL ALL OFF causes all modules to be turned off.
  - ♦ MANUAL ON enables manual control of the modules. The number of rows "on" is controlled by the "## MANUAL ROWS" selection.

GLOBAL VS. LOCAL MANUAL/AUTOMATIC CONTROL

Note that global AUTO/MANUAL OFF/MANUAL ON is overridden by local HOA OFF/HOA MANUAL/HOA AUTO which is selected from the MODULE screen. Under normal operating conditions, the local mode should be set to AUTO at the MODULE screen; this enables operator control via the global setting which is accessed from the CHANNEL screen.

- The following parameters are displayed:

  POLLING indicates that a polling cycle is in progress, the PLC is communicating directly with the modules to gather operating information.
  ROWS ON indicates the number of rows on in the subject channel.
  LAMPS OUT indicates the number of lamps out in the subject channel. The controller automatically increases the rows called for to compensate for lamps which are out or cannot be confirmed to be operating properly (in the event of a communications failure, the lamp is assumed to be out).
  UV INTENSITY is a weighted average, displayed in mw/cm^2 of all modules assigned to monitor photosensors (see module screen for assigning modules with sensors). Note that the intensity alarm is based on the photosensor reading displayed on this screen.

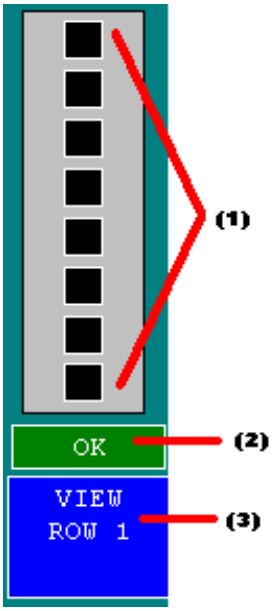


3.3 MODULE SCREEN

The MODULE screen displays an overview of the specific module's status. The following options are accessible:

- MAIN returns to MAIN screen.
- CHANNEL returns to the CHANNEL screen.
- ALARMS accesses the ALARM screen.
- CLEANING accesses the CLEANING screen.
- Assign UVINT sensor – Activates monitoring of the UV sensor. If there is a sensor installed and the module is "ON", a UV intensity value will be displayed. If there is no sensors signal, but the UV sensor is activated, an alarm will be indicated. Not all modules are equipped with sensors, normally just one per channel.
- DCA INFORMATION box displays the status of monitored points, as follows:
  - ♦ COMLINK indicates communication status between the module (DCA) and the PLC.
  - ♦ UV INT indicates the current intensity reading in MW/CM2. If there is no intensity monitor, the display is blank.
  - ♦ TEMP indicates the temperature status in the module. Each DCA and LCA has a circuit board mounted temperature probe which constantly monitors the ambient temperature in the module and initiates an alarm if it exceeds a pre-set limit.

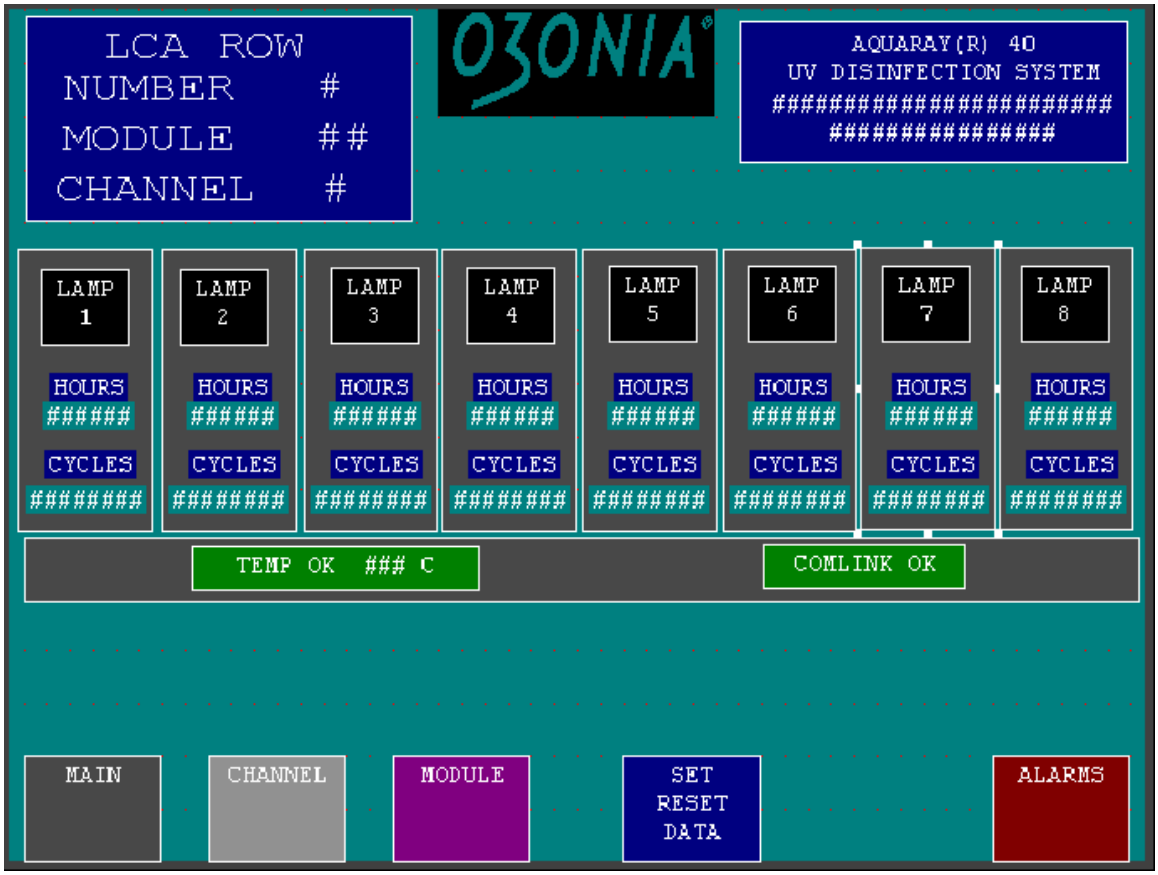
- ♦ BATTERY indicates the status of the backup battery mounted on the DCA. The purpose of the battery is to store information about the module – hours, cycles, photosensor data. If a battery alarm is indicated, the batteries on the DCA should be changed. There are 2 batteries, when changing the batteries change one first, leaving the other in the DCA to maintain stored values, then change the second once the first has been installed.
- ♦ ADJ LAMP indicates adjacent lamp failure in the subject module. Adjacent lamp failure is indicated whenever two or more adjacent lamps are out or cannot be confirmed to be in operation when called for.



- Row information is displayed, as follows:
  - ♦ (1) lamp status, off (black), on (green), alarm (red), timing out due to minimum run timer (yellow).
  - ♦ (2) row status, OK indicates that no alarms are present, ALARM indicates that an alarm condition exists, view row for detailed information.
  - ♦ (3) VIEW ROW accesses the ROW screen.
- HOA (Hand/Off/Auto) control is accessible. HOA OFF implements local manual OFF. HOA MANUAL implements local manual ON control. HOA AUTO is the normal mode of operation; it enables control of the subject module from the CHANNEL screen (global control enabled).

GLOBAL VS. LOCAL MANUAL/AUTOMATIC CONTROL

Note that global AUTO/MANUAL OFF/MANUAL ON is overridden by local HOA OFF/HOA MANUAL/HOA AUTO which is selected from the MODULE screen. Under normal operating conditions, the local mode should be set to AUTO at the MODULE screen; this enables operator control via the global setting which is accessed from the CHANNEL screen.



3.4 LCA ROW SCREEN

The LCA ROW screen displays an overview of the status for an individual row of lamps. The following options are accessible:

- MAIN returns to MAIN screen.
- CHANNEL returns to the CHANNEL screen.
- MODULE returns to the MODULE screen.
- SET RESET DATA accesses the LCA ROW SET/RESET DATA screen (password protected)
- ALARMS accesses the ALARM screen.

The following data is displayed:

LAMP STATUS is indicated by the box labeled LAMP X, indicating off (black), on (green), alarm (red), timing out due to minimum run timer (yellow).
HOURS indicates actual operating hours for the subject lamp.
CYCLES indicates actual cycles for the subject lamp.

Note that when a lamp is replaced the hours and cycles should be reset by accessing the LCA ROW SET/RESET DATA screen. (password protected)

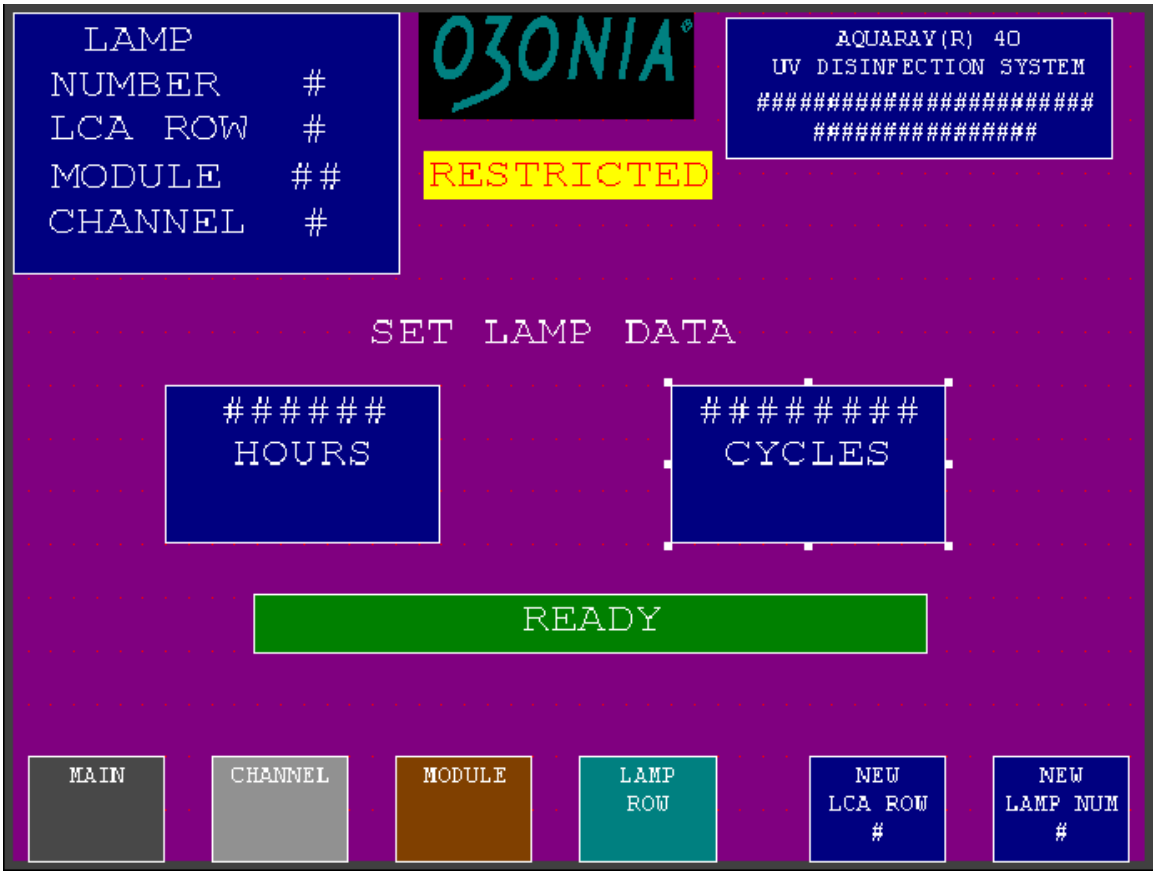
TEMP indicates the temperature status, OK (green), alarm (red).
COMLINK indicates the communication status between the DCA and LCA for the subject row.

3.5 LCA ROW SET ROW DATA SCREEN

The LCA ROW SET/RESET DATA SCREEN enables the operator to set or reset lamp hours and cycles. The following options are accessible:

- MAIN returns to MAIN screen.
- CHANNEL returns to the CHANNEL screen.
- MODULE returns to the MODULE screen.
- LAMP ROW returns to the LAMP ROW screen.
- ALARMS accesses the ALARM screen.

Two options are accessible which alter the stored value for the HOURS and CYCLES for the specific lamp. RESET HOURS & CYCLES sets the hours and cycles to 0. This function is used when replacing a lamp. SET HOURS & CYCLES enables the operator to store a specific value for the hours and cycles for a specific lamp. This function is used if the DCA is replaced and information regarding hours and cycles is lost.

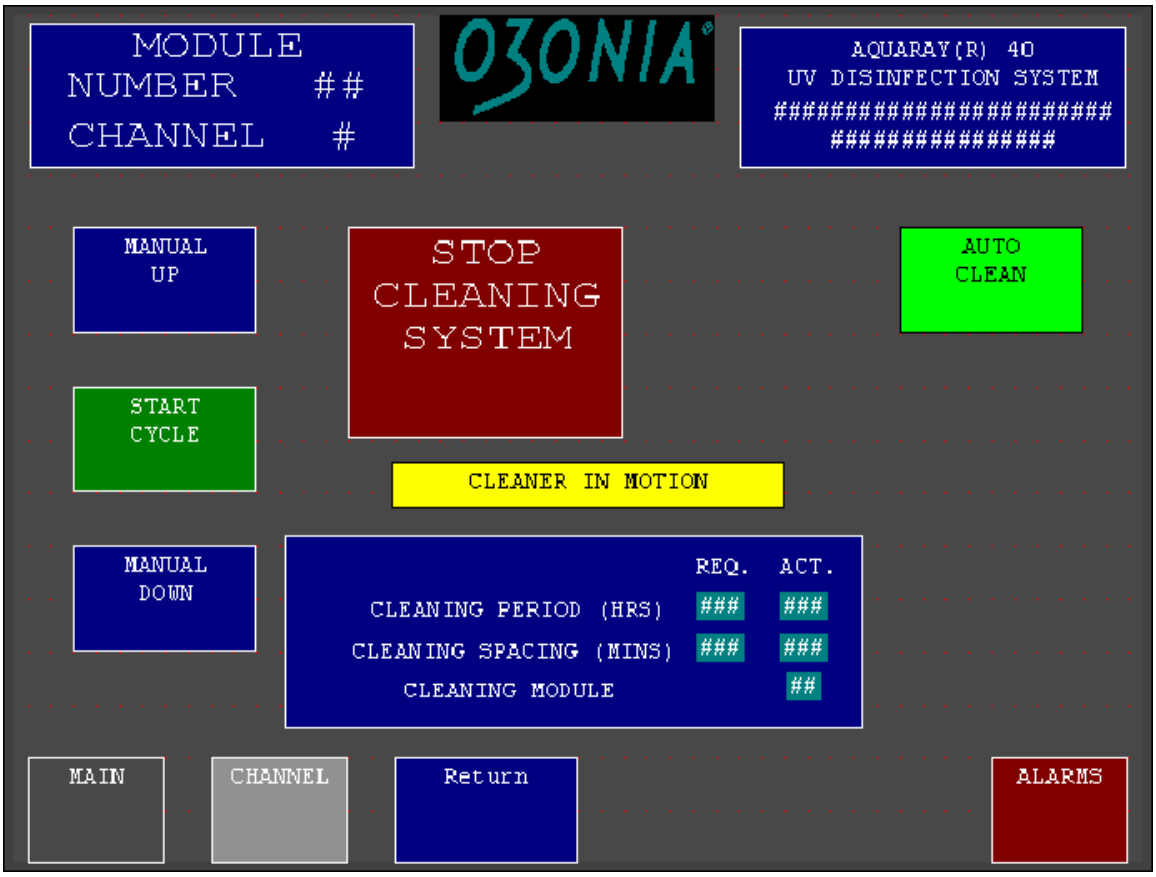


3.6 LCA ROW SET LAMP DATA SCREEN

The LCA ROW SET LAMP DATA SCREEN enables the operator to set lamp hours and cycles. The following options are accessible:

- MAIN returns to MAIN screen.
- CHANNEL returns to the CHANNEL screen.
- MODULE returns to the MODULE screen.
- LAMP ROW returns to the LAMP ROW screen.

The box labeled HOURS enables the operator to enter a specific value for the hours stored for a specific lamp. The box labeled CYCLES enables the operator to enter a specific value for the cycles stored for a specific lamp. This function is used if the DCA is replaced and information regarding hours and cycles is lost.



3.7 CLEANING SYSTEM CONTROL SCREEN

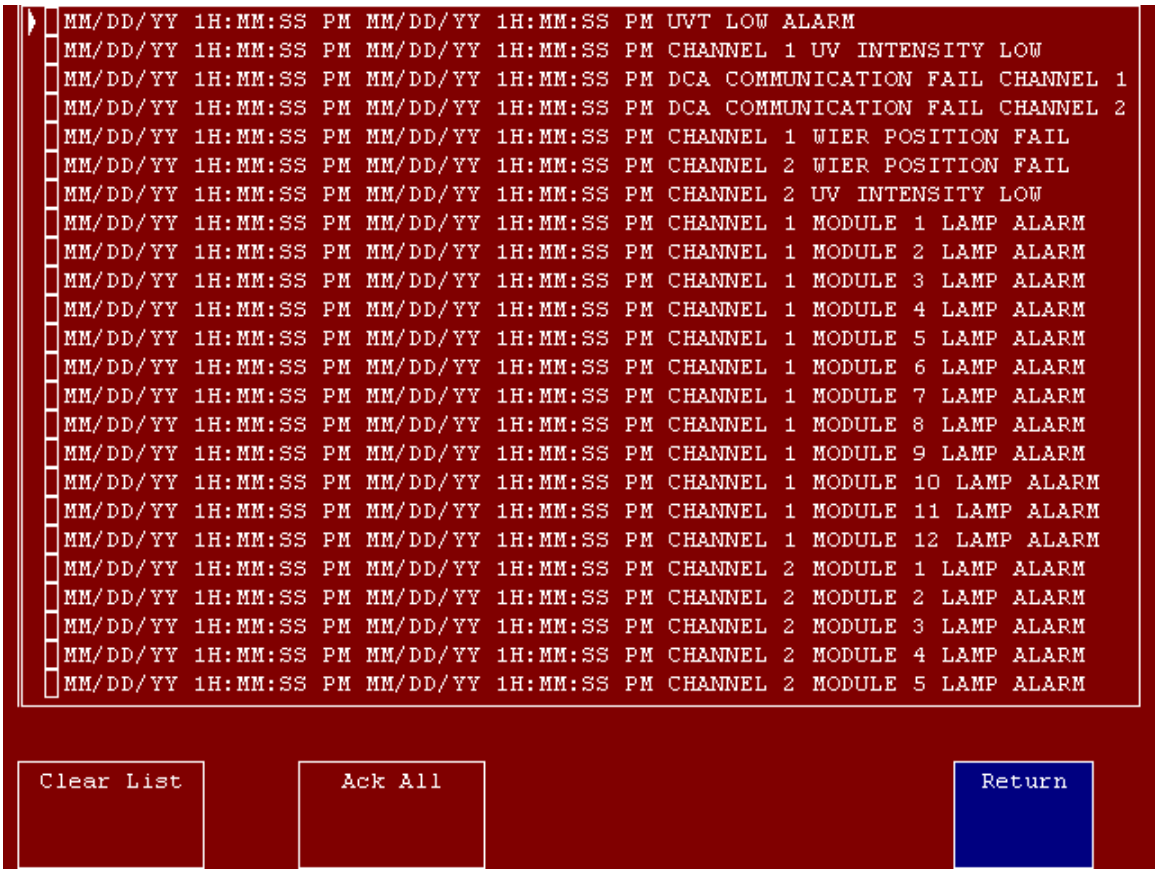
This screen enables control and monitoring of the cleaning system, as follows:

- In the center of the screen is the STOP CLEANING SYSTEM button manually halts all operation of the cleaning system until another selection is made.
- MANUAL CONTROL: On the left side of the screen are the MANUAL UP, START CYCLE, AND MANUAL DOWN selections which enable the operator to manually control the cleaning system.
- AUTOMATIC CONTROL: on the right side of the screen is the AUTO CLEAN selection which places the cleaning system for the module in question into automatic mode.

Data displayed on the screen includes: (REQ is the setpoint, ACT is the actual count since last initiation)

- CLEANING PERIOD which is the time between automatic initiation of cleaning cycles. Set to 24 hrs normally.
- CLEANING SPACING is the time between initiation of cleaning of successive modules in the channel. Normally this is set to 15 minutes.
- CLEANING MODULE – Indicates that the module is being cleaned at this time.
- WIPER STATUS bar – shows “Cleaner at top” when it is parked, “cleaner moving up” or “cleaner moving down” when the cleaner is in motion, “cleaner at bottom” only appears when the unit has been manually operated (since as soon as it hits the bottom it starts back up to the top, this state is never reported under automatic operation). If no status is detected, “cleaner in motion” appears, this happens when the status of the cleaner cannot be confirmed by the controller. In this case, the cleaner should be run up manually until the top limit switch is made (“cleaner at top”), the operation should be manually verified by the operator if this is the case.

Setpoints are changed via the CONFIGURATION screen.



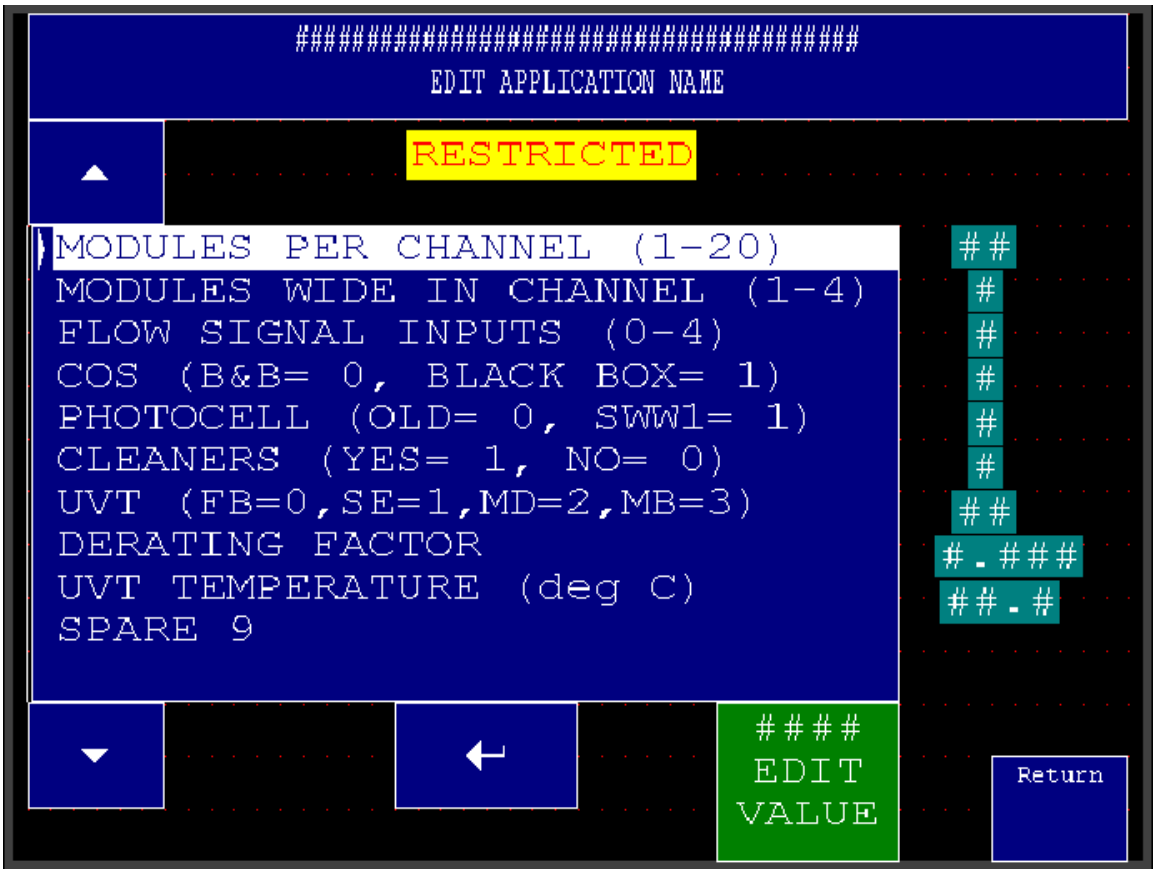
3.8 ALARM SCREEN

The ALARM screen displays an historical list of all alarms, whether or not they are still pending. The CLEAR LIST selection clears the list. The ACK ALL selection acknowledges all of the alarms on the list, and removes the alarm banner.

The data on the screen is configured as follows:

(date/time of alarm)(date/time of acknowledgement)(alarm description)

Note that during normal operation any alarms that are detected will be indicated by an “alarm popup” banner on the screen which must be “cleared” before the screens can be accessed. At times, multiple alarms may be indicated in which case the “clear” button must be pressed multiple times.



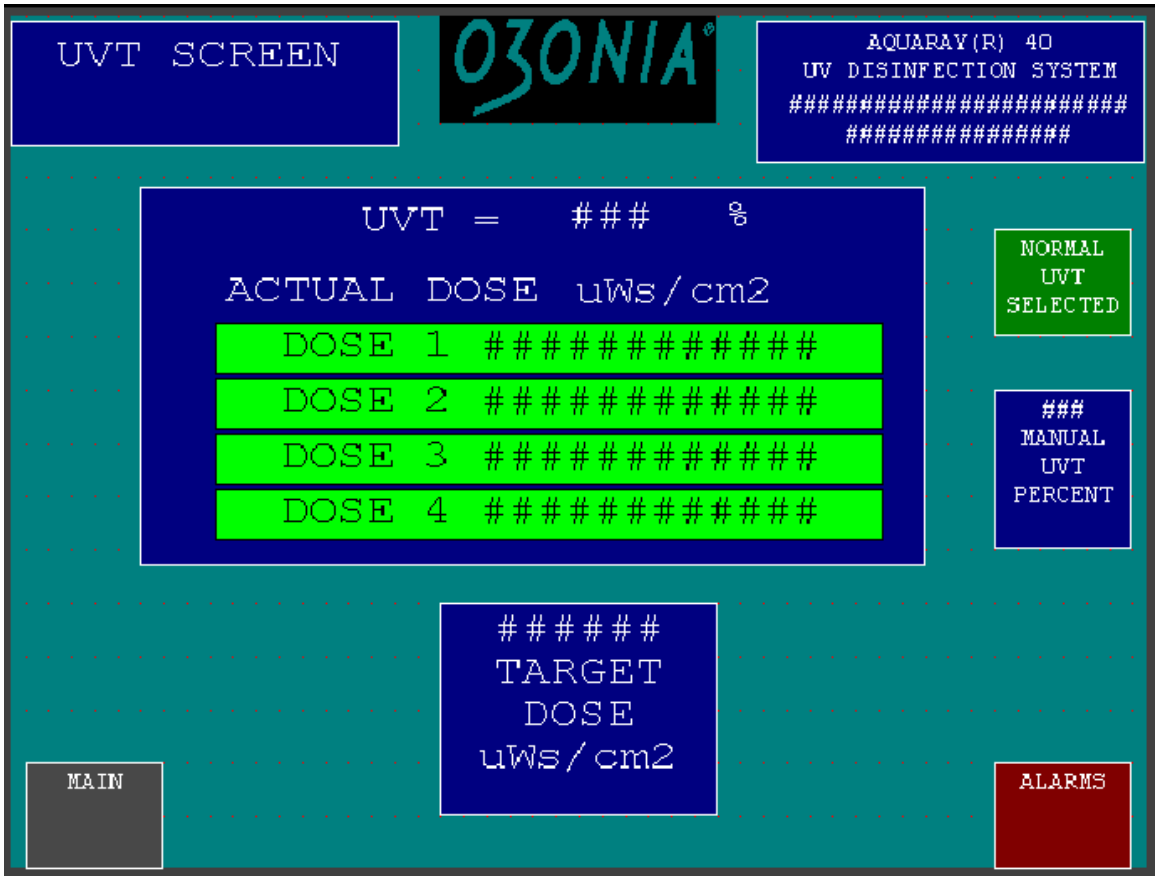
3.9 CONFIGURATION SCREEN

The configuration screen allows the operator to alter operational settings in the PLC. The following are accessible:

Note: Use the  and  buttons to highlight the desired selection. Use the  button to alter the selection. Note that the decimal point is fixed and cannot be moved or over-written.

- MIN RUN TIMER – the lamps must run for a minimum of 4 hours (240 mins) any time that they are turned on, this feature limits cycling of the lamps. The timer can be increased to a value above 4 hours, but if it is set to a value lower than 4 hours excessive lamp cycling could result. If the timer is set to less than 4 hours, lamp and equipment warranties are voided because of the possibility of excessive cycling of lamps and other equipment in the modules.
- MINIMUM ROWS ON – the mininum number of rows on is generally set to 5 for most installations, reuse installations sometimes require a higher number (normally 10 rows minimum) The minimum number of rows on is overridden by LOCAL and GLOBAL manual operation.
- UV INTENSITY LOW – is generally set to 1 mw/cm2.

- FLOW LEVEL AT 20 MA is the flow level that is represented by the flow meter at 20 mA. This is important since the operation of the equipment is based on flow rate; an improper flow setting can cause over- or under- dosing of the flow.
- PLANT DESIGN FLOW is the maximum flow for which the system is designed to provide disinfection. This value represents the peak flow to be treated when all modules are in operation. The number of lamp rows in operation is calculated based on this peak flow, for flows less than the peak the number of lamp rows in operation is proportionally less.
- CLEANING PERIOD and SPACING are default setpoints for the cleaning system; normally the period is set to 24 hrs (once a day) and the spacing is set to 0 mins (all modules will be cleaned simultaneously)



3.10 UVT AND DOSE CONTROL SCREEN

Some systems are designed to be controlled to provide a target dose based on the reading from an on-line UV Transmittance analyzer. Systems which do not include the on-line analyzer are simply controlled based on design conditions in relation to the current flow rate.

This screen displays the current UVT as measured by the online UVT analyzer, the current calculated operational dose, and the target dose. The target dose can be altered from this screen by selecting the TARGET DOSE button.

#	Pos	Qty	Description	Ozonia Part#
1				
2			**Refer to Ozonia Dwg # X0030-H20**	
3				
4			**MODULE ASSEMBLY**	
5	**1**	**1**	**Module Assembly (Complete Unit)**	**X0030-H20**
6				
7			**FRAME & ENCLOSURE ASSEMBLY**	
8	**1**	**1**	**Frame & Enclosure Assembly**	**X0024-H09**
9	1-1	14	1/4"-20 HEX NUT	M0001-H01
10	1-2	4	1/4"-20 UNC NYLON INSERT HEX NUT	M0002-H01
11	1-3	48	#10 UNC x 1/2" A/R SELF DRILL AND TAP SCREW	M0006-H02
12	1-4	4	1/4"-20 UNC x 2" LONG PAN HEAD SCREW	M0005-H01
13	1-5	2	1/4"-20 UNC x 1" LONG PAN HEAD SCREW	M0005-H02
14	1-6	14	#6 x 1/2 UNC x 5/8" A/R SELF DRILL AND TAP SCREW	M0006-H01
15	1-7	2	1/4"-20 UNC x 1/2" LONG ROUND HEAD MACHINE SCREWS	M0007-H01
16	1-8	20	1/4"-28 HEX NUT	M0013-H03
17	1-9	22	1/4" WASHER	M0014-H01
18	1-10	20	1/4"-28 x 11/16" LG. STUD	M0024-H01
19	1-11	20	1/2"-28 x 1.5" LG. HEX HEAD CAP SCREW	M0025-H01
20	1-12	1	MODULE ENCLOSURE	X0024-G47
21	1-13	1	FRAME BOTTOM PAN	X0024-G02
22	1-14	1	COOLING FAN MOUNTING SHROUD	X0024-G03
23	1-15	6	EMKA LATCH	X0024-G05
24	1-16	6	HEYCO SEALING WASHER	X0024-G06
25	1-17	2	LID HINGE	X0024-G07
26	1-18	1	MODULE FRAME WELDMENT	X0024-G48
27	1-19	1	LID ENCLOSURE ASSEMBLY	X0024-G09
28	1-20	1	HEAT SINK (RIGHT SIDE, END SIDE, LEFT SIDE)	X0024-G10
29	1-21	1	LIFTING EYE	X0024-G13
30	1-22	20	SPRING	X0024-G14
31	1-23	20	BEVELED WASHER	X0024-G15
32	1-24	1	3/4" MALE COUPLING x BSPP FEMALE THREAD	X0024-G28
33	1-25	2	FAN	X0024-G29
34	1-26	1	HINGE SIDE LIFTING EYE	X0024-G45
35	1-27	1	PIN SURFACE-MOUNT HINGE WITHOUT HOLES	X0024-G46
36				
37				
38			**WIPER MOTOR ASSEMBLY**	
6	**2**	**1**	**WIPER MOTOR ASSEMBLY**	**X0002-H04**
40	2-1	2	NYLON INSERT HEX NUT 1/4"-20 UNC	M0001-H01
41	2-2	4	HEX NUT 1/4"-20 UNC	M0002-H01
42	2-3	8	WASHER FLAT 1/4" DIA.	M0014-H01
43	2-4	1	WASHER FLAT 3/8" DIA.	M0014-H02
44	2-5	1	SPRING PIN 1/8" DIA. 1-1/4 LG.	M0009-H02
45				

CHECKED: MDL 09/6/11	TITLE: **Aquaray® 40 "HO" Module (Warm Lamp)**		SHT: 1 of 4
APPROVED: BM	OZONIA Ozonia North America LLC 600 Willow Tree Road Leonia, NJ 07605	DWG No: **18000-02-0167**	REV: A

#	Pos	Qty	Description	Ozonia Part#
46				
47	2-8	1	SHAFT SEAL	X0002-G17
48	2-9	1	MOUNTING BRACKET	X0002-G18
49	2-10	1	TORQUE LIMITER	X0002-G19
50	2-11	1	CLEANING SYSTEM SCREW	X0002-G20
51	2-12	1	LOWER BEARING BLOCK	X0002-G21
52	2-13	1	ENCLOSURE SHAFT BEARING	X0002-G22
53	2-14	1	THREADED SHAFT COLLAR	X0002-G32
54	2-15	1	BEARING SKF 7200BEP	X0002-G24
55	2-16	1	LOWER SCREW NUT	X0002-G25
56	2-17	1	MOTOR	X0002-G27
57	2-18	1	GEAR HEAD	X0002-G43
58				
59			**MECHNICAL LIMIT SWITCH ASSEMBLY**	
60	**3**	**1**	**MECHANICAL LIMIT SWITCH**	**X0026-H01**
61	3-1	2	1/4"-20 HEX NUT	M0001-H01
62	3-2	4	#4-40 UNC HEX NUT	M0001-H02
63	3-3	8	1/4" FLAT WASHER	M0014-H01
64	3-4	1	SPACER UNTHREADED 1/2" O.D. x 1 1/2" LG.	M0012-H03
65	3-5	4	E-STYLE RETAINING RING 1/4" DIA. ROD	M0008-H01
66	3-6	4	SPACER UNTHREADED 1/4" O.D. x 3/16" LG.	M0012-H02
67	3-7	2	JAM NUTS HEX 7/16"-20 UNF	M0016-H01
68	3-8	8	#4 FLAT WASHER	M0014-H03
69	3-9	4	#4-40 SOCKET HEAD CAP SCREW x 7/8" LG.	M0017-H01
70	3-10	2	SPRING PINS	M0009-H01
71	3-11	2	LIMIT SWITCH MINIATURE SNAP ACTING SPDT	X0026-G01
72	3-12	1	SWITCH BRACKET	X0026-G02
73	3-13	1	ENCLOSURE LIMIT SWITCH BEARING BLOCK	X0026-G03
74	3-14	1	SWITCH ACTUATION ROD	X0026-G04
75	3-15	1	SHAFT SEAL	X0026-G05
76	3-16	2	SPRING	X0026-G06
77	3-17	1	SCREW ADJUSTER	X0026-G07
78	3-18	2	SWITCH ACTUATOR	X0026-G08
79				
80			**JACKET WIPER PLATE ASSEMBLY**	
81	**4**	**1**	**JACKET WIPER PLATE ASSEMBLY**	**X0025-H01**
82	4-1	10	1/4"-20 UNC HEX NUT	M0001-H01
83	4-2	2	SET SCREW #8-32 UNC x 3/16"	M0010-H01
84	4-3	10	SPACER UNTHREADED 1/2" OD x 3/16" LG.	M0012-H01
85	4-4	10	1/4" LOCK WASHER	M0022-H01
86	4-5	1	CLEANING PLATE (UPPER)	X0025-G01
87	4-6	1	CLEANING PLATE (LOWER)	X0025-G02
88	4-7	40	WIPER BRUSH 1.75 TURN	X0025-G03
89	4-8	1	POWERAC PLASTIC ACTUATING NUT	X0025-G04
90	4-9	1	POWERAC PLASTIC ACTUATING NUT (NO THREAD)	X0025-G06
91				

CHECKED: MDL 09/6/11	TITLE: **Aquaray® 40 "HO" Module (Warm Lamp)**		SHT: 2 of 4
APPROVED: BM	OZONIA Ozonia North America LLC 600 Willow Tree Road Leonia, NJ 07605	DWG No: **18000-02-0167**	REV: **A**

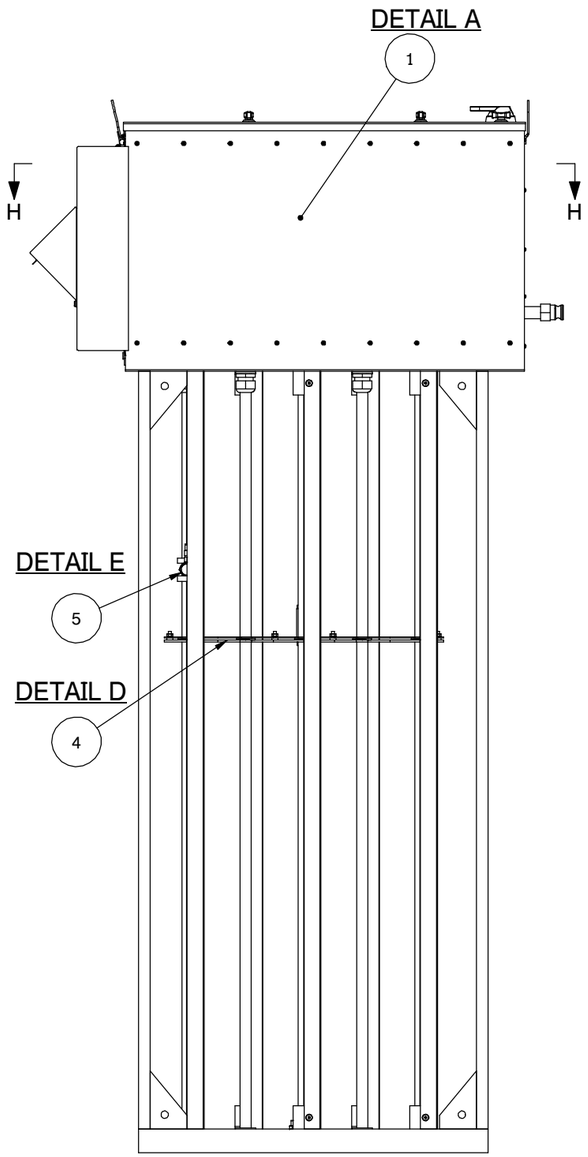
#	Pos	Qty	Description	Ozonia Part#
92				
93			**SENSOR CABLE & MOUNTING ASSEMBLY**	
94	**5**	**1**	**SENSOR MOUNTING & CABLE ASSEMBLY**	**X0017-H06**
95	5-1	1	UV SENSOR	X0017-G18
96	5-2	1	AMPLIFIER BODY	X0017-G21
97	5-3	1	5" CABLE	X0017-G22
98	5-4	1	19" CABLE	X0017-G23
99	5-5	1	O-RING	X0017-G24
100	5-6	1	AMPLIFIER BRACKET ASSY	X0017-G25
101	5-7	1	NUT HUBBLE	X0017-G26
102				
103				
104			**TOP LAMP SUPPORT ASSEMBLY**	
105	**6**	**40**	**TOP LAMP SUPPORT ASSEMBLY**	**X0027-H01**
106	6-1	1	GLAND NUT	X0027-G01
107	6-2	1	SEALING RING	X0027-G02
108	6-3	1	LOCK-NUT	X0027-G03
109				
110			**BOTTOM LAMP SUPPORT ASSEMBLY**	
111	**7**	**40**	**BOTTOM LAMP SUPPORT ASSEMBLY**	**X0031-H01**
112	7-1	1	CLOSED END GROMMET	X0031-G01
113	7-2	1	SILICON SPONGE FILLER	X0031-G02
114	7-3	1	SPACER CLIP	X0031-G03
115				
116			**QUARTZ TUBE**	
117	**8**	**40**	**QUARTZ TUBE**	**X0015-H13**
118				
119			**UV LAMP**	
120	**9**	**40**	**UV LAMP**	**X0016-H09**
121				
122			**ELECTRONIC BALLAST**	
123	**10**	**20**	**ELECTRONIC BALLAST**	**X0029-H01**
124				
125			**DISCONNECT SWITCH ASSEMBLY**	
126	11	**1**	**DISCONNECT SWITCH ASSEMBLY**	**X0028-H01**
127	11-1	2	NUT HEX 1/4"-20UNC	M0001-H01
128	11-2	6	NUT HEX #8-32UNC	M0001-H03
129	11-3	2	WASHER FLAT 1/4"	M0014-H01
130	11-4	6	WASHER FLAT #8	M0014-H04
131	11-5	6	MACHINE SCREW RND HEAD #8	M0007-H02
132	11-6	1	DOOR SWITCH MOUNTING BRACKET	X0028-G01
133				
134				
135				
136				

CHECKED: MDL 09/6/11	TITLE: **Aquaray® 40 "HO" Module (Warm Lamp)**		SHT: 3 of 4
APPROVED: BM	OZONIA Ozonia North America LLC 600 Willow Tree Road Leonia, NJ 07605	DWG No: **18000-02-0167**	REV: **A**

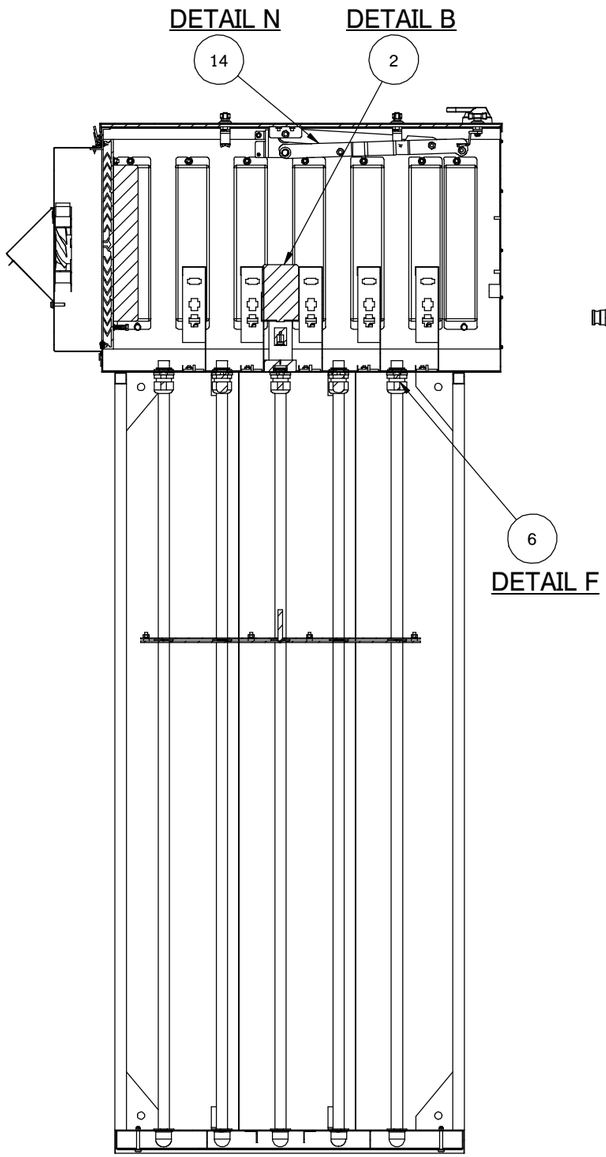
#	Pos	Qty	Description	Ozonia Part#
137				
138				
139			**LCA ASSEMBLY**	
140	**12**	**5**	**LCA ASSEMBLY**	**X0056-H01**
141				
142			**DCA ASSEMBLY**	
143	**13**	**1**	**DCA ASSEMBLY**	**X0057-H01**
144				
145				
146				
147			**LID HOLDER ASSEMBLY**	
148	**14**	**1**	**LID HOLDER ASSEMBLY**	**X0069-H01**
149	14-1	2	PAN HEAD PHILLIPS TAPPING SCREW	M0006-H01
150	14-2	2	M6 WASHER	M0027-H02
151	14-3	5	M8 WASHER	M0027-H03
152	14-4	2	M6 HEX NUT	M0028-H03
153	14-5	4	M8 x 25 HEX HEAD SCREW	M0029-H03
154	14-6	1	M8 x 35 HEX HEAD SCREW	M0029-H04
155	14-7	2	M6 x 12 HEX HEAD SCREW	M0029-H05
156	14-8	1	UPPER LEVER	X0069-G01
157	14-9	1	LOWER LEVER	X0069-G02
158	14-10	1	ENCLOSURE HOLDER MOUNTING BRACKET	X0069-G03
159	14-11	1	LID HOLDER MOUNTING BRACKET	X0069-G04
160	14-12	5	M8 DIN 292 WELDED NUT	X0069-G05
161	14-13	5	INSERT BUSHING	X0069-G06
162	14-14	1	22mm O.D. x 8mm I.D. SPACER	X0069-G07
163	14-15	2	M6 x 15mm STUD	X0069-G08
164	14-16	4	LARGE O.D. WASHER	X0069-G09
165	14-17	2	M6 DIN 292 WELDED NUT	X0069-G10
166	14-18	1	QUICK RELEASE PIN	X0069-G14
167				
168				
169				
170				
171				
172				
173				
174				
175				
176				
177				
178				
179				
180				
181				

CHECKED: MDL 09/6/11	TITLE: **Aquaray® 40 "HO" Module (Warm Lamp)**	SHT: 4 of 4
APPROVED: BM	OZONIA Ozonia North America LLC 600 Willow Tree Road Leonia, NJ 07605	DWG No: **18000-02-0167** REV: **A**

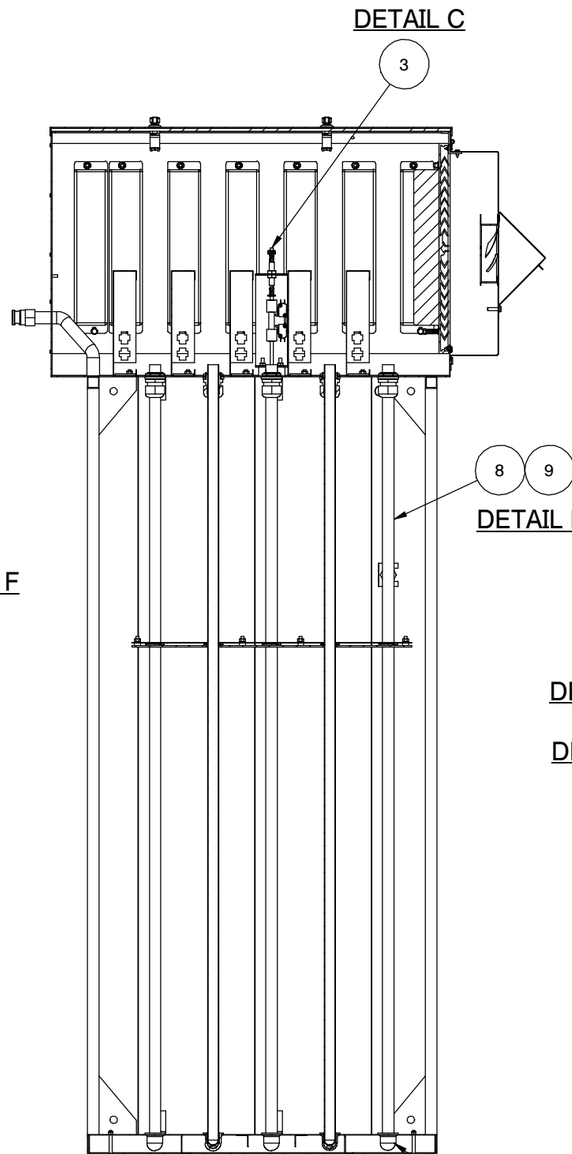
THIS PAGE IS INTENTIONALLY LEFT BLANK



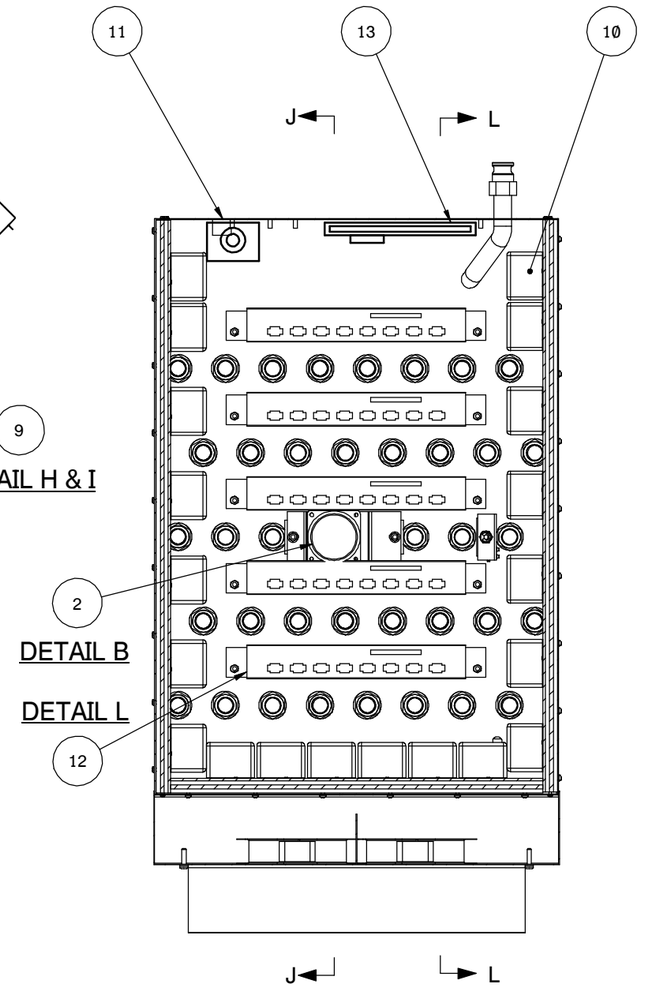
SIDE VIEW



SECTION J-J
SCALE 1 : 6.5



SECTION L-L
SCALE 1 : 6.5



SECTION H-H
SCALE 1 : 4.5

X0030-H20

REV.	DESCRIPTION	DRAWN	APPD.	DATE

SCALE: N.T.S
DRAWN: 08/25/11 MDL
CHECKED: 08/25/11 MDL
APPROVED:

TITLE: AQUARAY "40" HO MODULE ASSEMBLY

OZONIA

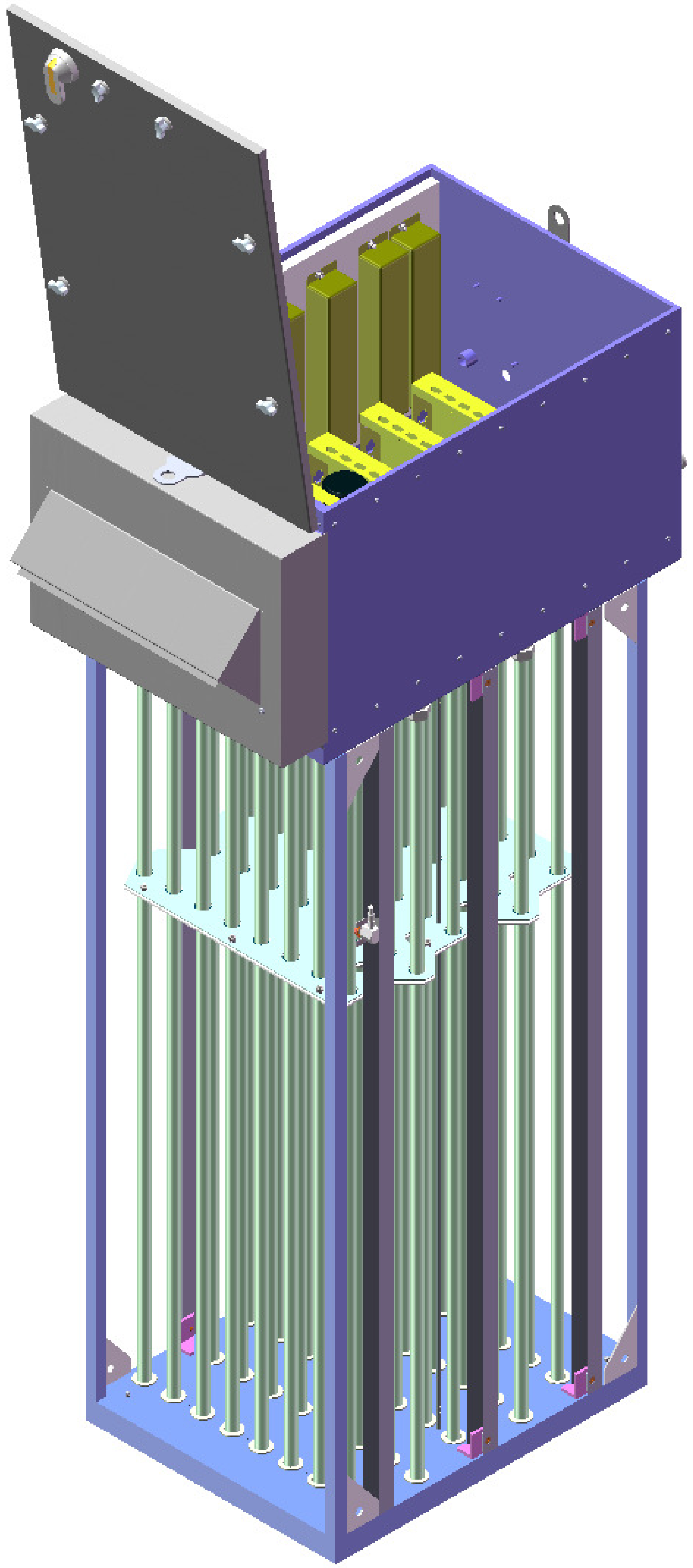
OZONIA NORTH AMERICA
Post Office Box 455
Elmwood Park, New Jersey 07407

SHT.: 1 OF 6

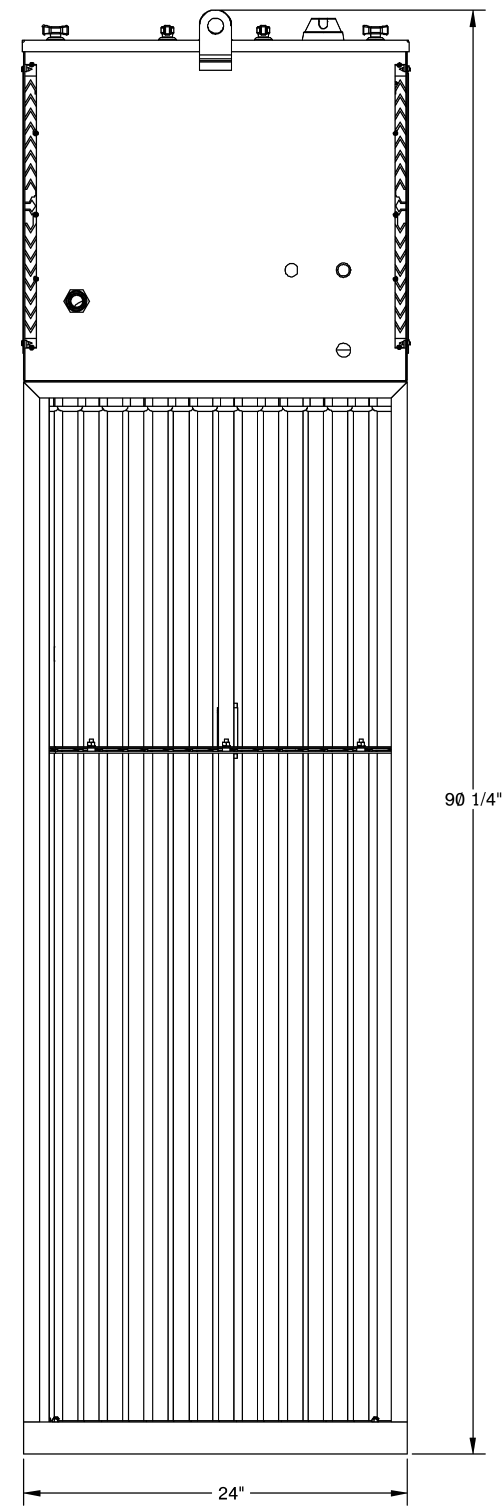
SIZE: D

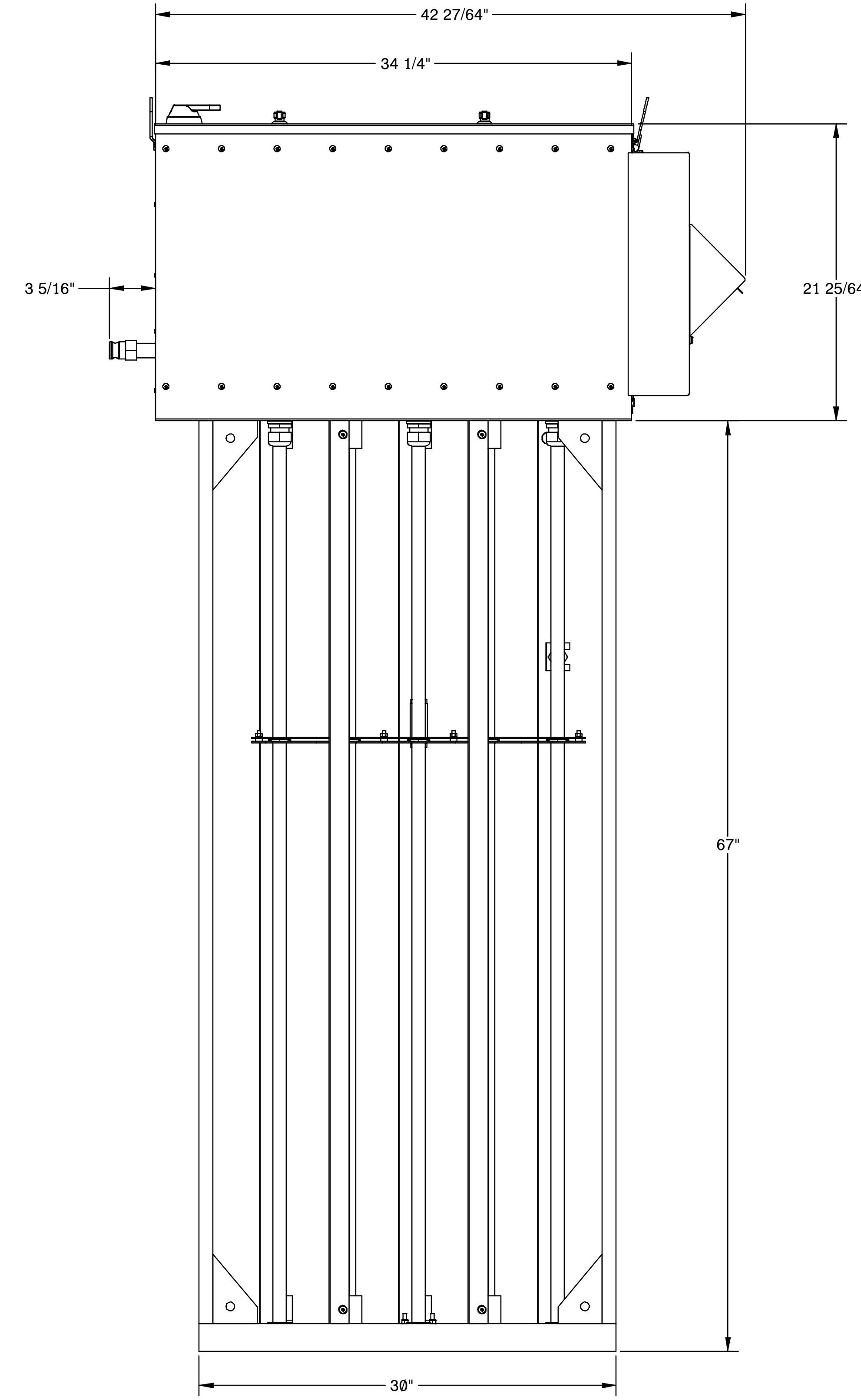
DWG. NO.: X0030

REV.:



ISOMETRIC VIEW



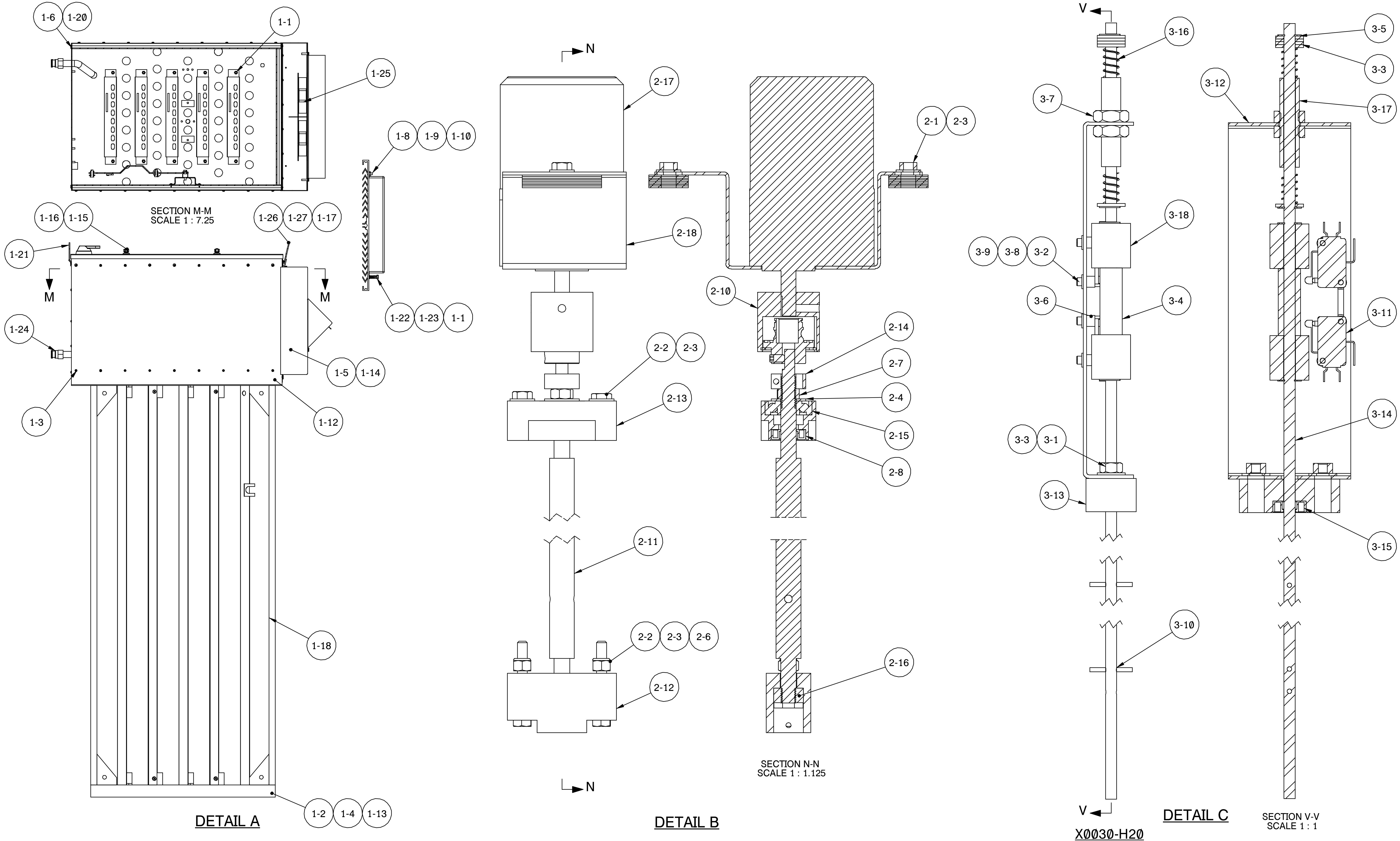


X0030-H20

					SCALE: N.T.S	TITLE: AQUARAY "40" HO MODULE ASSEMBLY
					DRAWN: 08/25/11 MDL	
					CHECKED: 08/25/11 MDL	
REV.	DESCRIPTION	DRAWN	APPD.	DATE	APPROVED:	

OZONIA NORTH AMERICA
Post Office Box 455
Elmwood Park, New Jersey 07407

SHT.: 2 OF 6	SIZE: D	DWG. NO.: X0030	REV.:



					SCALE: N.T.S
					DRAWN: 08/25/11 MDL
					CHECKED: 08/25/11 MDL
REV.	DESCRIPTION	DRAWN	APPD.	DATE	APPROVED:

TITLE:

AQUARAY "40" HO MODULE ASSEMBLY

OZONIA

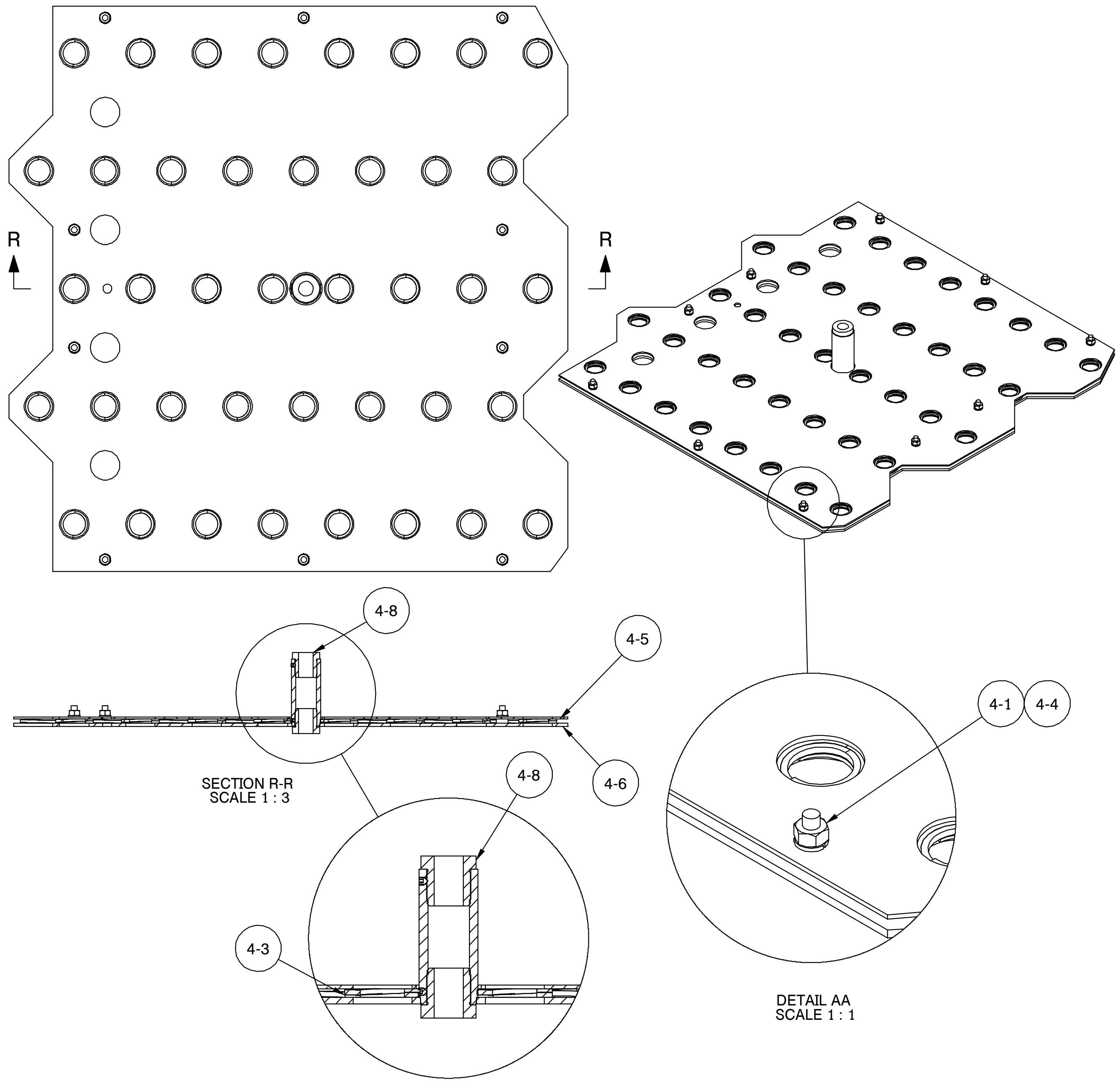
OZONIA NORTH AMERICA
Post Office Box 455
Elmwood Park, New Jersey 07407

SHT.: 3 OF 6

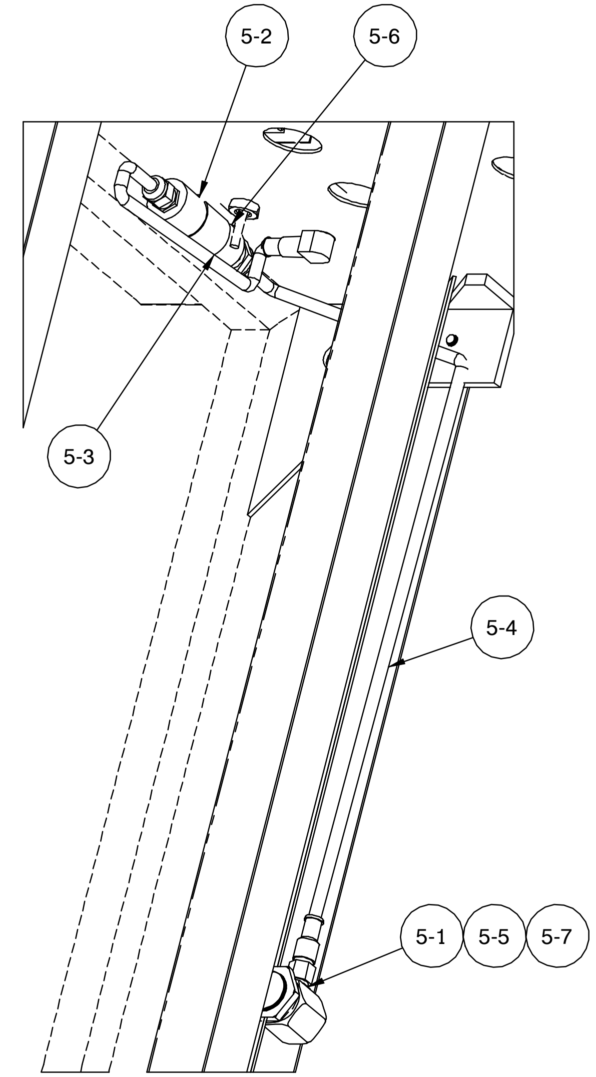
SIZE: D

DWG. NO.: X0030

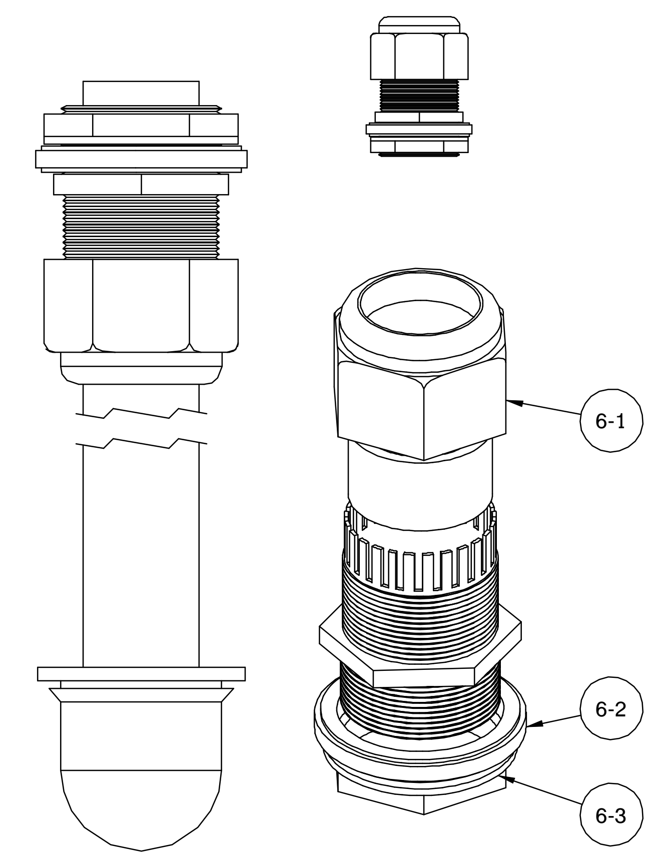
REV.:



DETAIL D



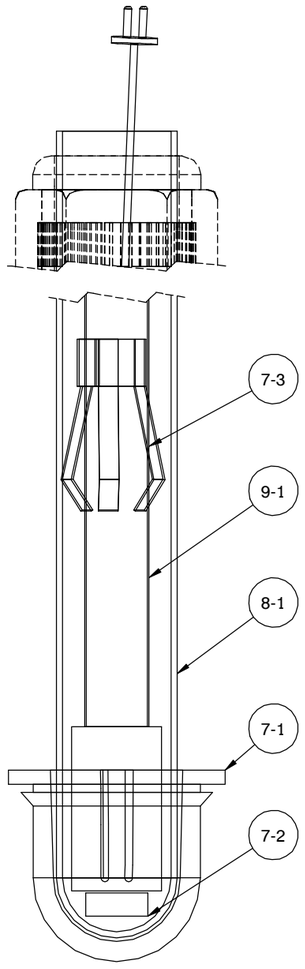
DETAIL E



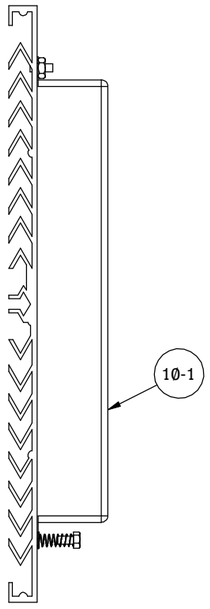
DETAIL F

X0030-H20

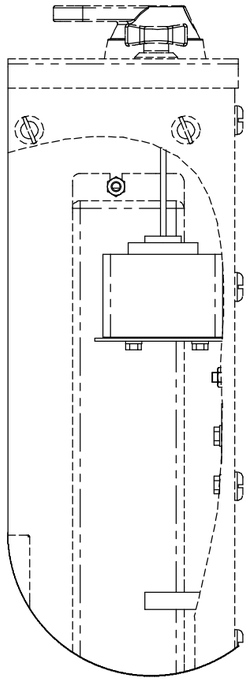
				SCALE: N.T.S	TITLE: AQUARAY "40" HO MODULE ASSEMBLY	OZONIA — OZONIA NORTH AMERICA, Post Office Box 455, Elmwood Park, New Jersey 07407	SHT.: 4 OF 6
				DRAWN: 08/25/11 MDL			
				CHECKED: 08/25/11 MDL		SIZE: D — DWG. NO.: X0030	REV.:
REV.	DESCRIPTION	DRAWN	APPD.	DATE	APPROVED:		



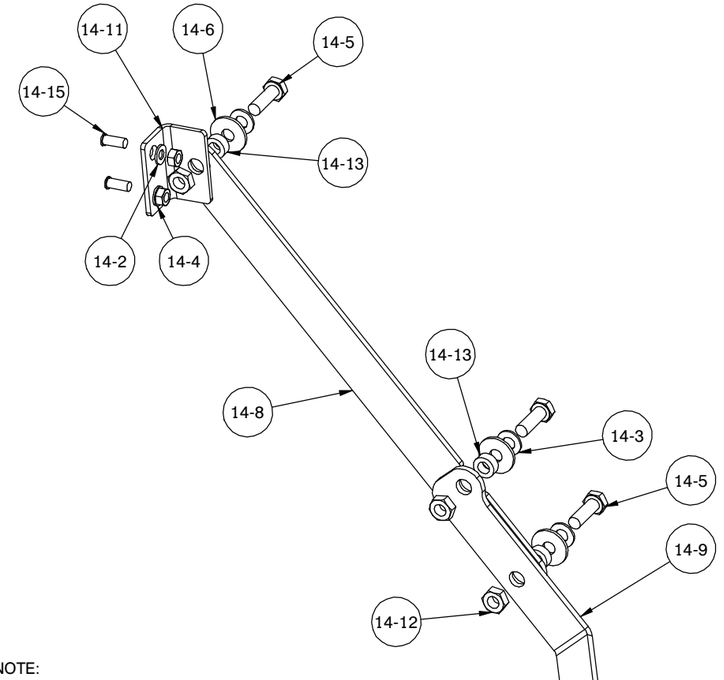
DETAIL G, H, & I



DETAIL J

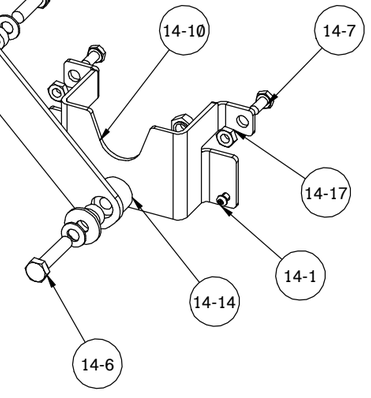


DETAIL K



NOTE:

NUMBERING DETAIL
SEE DWG. X0028-H03



DETAIL N

X0030-H20

REV.	DESCRIPTION	DRAWN	APPD.	DATE

SCALE: N.T.S
DRAWN: 08/25/11 MDL
CHECKED: 08/25/11 MDL
APPROVED:

TITLE: AQUARAY "40" HO MODULE ASSEMBLY

OZONIA

OZONIA NORTH AMERICA
Post Office Box 455
Elmwood Park, New Jersey 07407

SHT.: 5 OF 6

SIZE: D

DWG. NO.: X0030

REV.:

NOTES:

1. UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES.
2. FOR LIST OF PARTS REFER TO OZONIA DWG 18000-02-0167.
3. FOR ENCLOSURE DETAIL SEE: ENCLOSURE COMPONENT ASSEMBLY 18000-02-0228.

ITEM#	QTY.	DESCRIPTION	MANUF/SUPPL	MODEL#	PART#	OZONIA#	SIZE	MATERIAL	FINISH
-	1	AQUARAY 40 HO MODULE ASSEMBLY				X0030-H20			
1	1	MODULE FRAME ASSEMBLY				X0024-H09			
2	1	WIPER MOTOR ASSEMBLY				X0002-H04			
3	1	MECHANICAL LIMIT SWITCH ASSEMBLY				X0026-H01			
4	1	JACKET WIPER PLATE ASSEMBLY				X0025-H01			
5	1	SENSOR CABLE & MOUNTING ASSEMBLY				X0017-H06			
6	40	TOP LAMP SUPPORT ASSEMBLY				X0027-H01			
7	40	BOTTOM LAMP SUPPORT ASSEMBLY				X0031-H01			
8	40	QUARTZ TUBE				X0015-H13			
9	40	UV LAMP				X0016-H09			
10	20	ELECTRONIC BALLAST				X0029-H01			
11	1	DISCONNECT SWITCH ASSEMBLY				X0028-H01			
12	5	LCA ASSEMBLY				X0056-H01			
13	1	DCA ASSEMBLY				X0057-H01			
14	1	LID HOLDER ASSEMBLY				X0069-H01			
15		ENCLOSURE COMPONENT ASSEMBLY				18000-02-0228			

X0030-H20

REV.	DESCRIPTION	DRAWN	APPD.	DATE

SCALE: N.T.S
DRAWN: 08/25/11 MDL
CHECKED: 08/25/11 MDL
APPROVED:

TITLE: AQUARAY "40" HO MODULE ASSEMBLY

OZONIA NORTH AMERICA
Post Office Box 455
Elmwood Park, New Jersey 07407

SHT.: 6 OF 6
SIZE: D
DWG. NO.: X0030
REV.:

THIS PAGE IS INTENTIONALLY LEFT BLANK

40 HO UV LAMP SPECIFICATION SHEET

Description	Low Pressure High Output Lamp for Aquaray 40 HO VLS
UV Emission	At least 90% at 253.7 nm wavelength
UVC Lamp Output	52.0 UVC watts
UV lamp output (at distance of 1 meter in air)	370 µw/cm^2
Minimum Arc Length	58 inches
Power Consumption	Lamp: 166 watts Lamp and Auxiliary: 172 watts
Electrical Connections	non-proprietary pigtail with molded 2-wire connector
Features	- Low pressure mercury slimline, hot cathode instant start design in which the coiled filament cathodes are heated by the arc current. - Clamped filament design, significantly rugged to withstand shock and vibration. - Lamps produce no ozone - UV resistant lamp bases. - Design prevents electrical arcing between electrical connections in moist conditions.

CHECKED: SM 9.12.2011	TITLE: 40 HO LAMP SPECIFICATION			SHT: 1 of 1
APPROVED SM 9.12.2011	OZONIA — ***OZONIA NORTH AMERICA*** ***600 Willow Tree Road*** Leonia, NJ 07605	A	DWG No. 18000-77-0048	REV: B

40 HO QUARTZ SLEEVE SPECIFICATION SHEET

Description	Quartz Sleeve for Aquaray 40 HO VLS Lamp
Material	99.9% Silicon Dioxide
Minimum transmission at 253.7 nm wavelength	90%
Wall Thickness	1 mm, nominal
Features	- One end is closed test tube type and other is open and features smooth edges

CHECKED: RM.06.25.07	TITLE: 40 HO QUARTZ SLEEVE SPECIFICATION			SHT: 1 of 1
APPROVED:	OZONIA NORTH AMERICA 600 Willow Tree Road Leonia, NJ 07605	A	DWG No. 18000-77-0120	REV: -

40 HO ELECTRONIC BALLAST SPECIFICATION SHEET

Description	Electronic Ballast for Aquaray 40 HO VLS
Lamps Operated	2 per ballast
Input Voltage	230 VAC, 50/60 Hz nominal
Input Operating Voltage	200 to 250 VAC, 50/60 Hz
Input Current	1.5 Amps, nominal
Power Factor	> .95, nominal
Low Temperature	Starting: 0.0 °C @ nominal input
Maximum Case Temperature	70 °C (158°F)
Ballast Connector	AMP p/n 770969-1
Pin Configuration	1. AC Line Input 2. AC Line Input 3. Ground 4. Lamp 1 5. Common Lamp 1,2 6. Lamp 2
Isolation	Lamps are electrically isolated from the input

CHECKED: SM 9.12.2011	TITLE: AQUARAY 40 HO BALLAST SPECIFICATION			SHT: 1 of 1
APPROVED: SM 9.12.2011	OZONIA NORTH AMERICA 600 Willow Tree Road Leonia, NJ 07605	A	DWG No. 18000-77-0060	REV: B

40 HO LAMP CONTROL ASSEMBLY (LCA)

Description	Lamp control assembly for monitoring and controlling 40 HO lamps
Number per 40 HO module	5
Lamps Operated	8
Features	- Onboard diagnostic LED indicators to simplify diagnosis and repairs - All electronic boards conformally coated to protect against moisture and corrosion.

CHECKED: RM.06.25.07	TITLE: 40 HO LAMP CONTROL ASSEMBLY SPECIFICATION			SHT: 1 of 1
APPROVED:	OZONIA NORTH AMERICA 600 Willow Tree Road Leonia, NJ 07605	A	DWG No. 18000-77-0119	REV: -

40 HO DATA CONTROL ASSEMBLY (DCA) SPECIFICATION SHEET

Description	Data control assembly for providing coordinated command, control and communications between the UV modules and the UV control panel via RS485.
Number per 40 HO module	1
Lamps Operated	40

Features	- Onboard diagnostic LED indicators to simplify diagnosis and repairs
	- The DCA collects information on:
	  o Lamp Operation
	  o UV Intensity
	  o Temperature
	  o Backup Battery Condition
	- The DCA stores information regarding
	  o Lamp Operating Hours
	  o Lamp On/Off Cycles
	  o Module Identification

CHECKED: RM.06.25.07	TITLE: 40 HO DATA CONTROL ASSEMBLY SPECIFICATION			SHT: 1 of 1
APPROVED:	OZONIA NORTH AMERICA 600 Willow Tree Road Leonia, NJ 07605	A	DWG No. 18000-77-0118	REV: -

#	Tag No./Item No.	Qty	Manufacturer/Supplier	Manufacturer #	Ozonia #	Source #	Description	Rev
1	1	1	KORMAN SIGNS		X0053-H01		AQUARAY 40 DECAL	
2	2	1	WOODHEAD	5527W			CORD SEALING GRIP WITH O- RING, CABLE SIZE 0.312"-0.375" (FOR 0.345"	
3	3	1	SETON CO/ PROVIDED BY DALLAS	CAT. NO. M3270	X0053-H02		SETON GRAPHIC OSHA SIGN, 21/2" X 1 3/4" PRESSURE SENSITIVE VINYL, HIGH VOLTAGE,	A
4	4	2	INTERCON, INC		X0048-H01		HO BALLAST INTERCONNECT HARNESS	
5	5	1	CONXALL	P/N 4295			CONNECTOR CAP, MULTI-CON-X CAT. P/N 4295	
6	6	1	INTERCON, INC		X0049-H01		PHOTOCELL CONNECTOR ASSEMBLY	
7	7	1	MELTRIC/Dallas		X0047-H04		MODULE INPUT POWER CABLE ASSY. (6 AWG) (MELTRIC CONN.)	
8	8	1	THOMAS & BETTS	#2942NM			CORD SEALING GRIP 1" NPT, CABLE DIA. RANGE (.700" -.950")	
9	9	1	McMASTER-CARR	P/N 2140K56			DESICCANT, 8 OZ. PACKAGE	
10	10	1	INTERCON, INC		X0054-H01		POWER DISTRIBUTION HARNESS ASSEMBLY	
11	11	1	INTERCON, INC		X0050-H01		PHOTOCELL /DATA HARNESS ASSEMBLY	
12	12	1	COOPER/BUSSMAN	CDNF45			DISCONNECT SWITCH, 60 AMP	
13	13	1	COOPER/BUSSMAN	CDHXB65			HANDLES, PISTOL GRIP, BLACK, NEMA4X	
14	14	1	COOPER/BUSSMAN	CDS48P			SHAFT, FOR DISCONNECT SWITCHES	
15	15	2	EBM-PAPST	LZ120	X0085-H01		CORDSET FOR FAN	D
16	16	1	THOMAS & BETTS	# 2RB14X OR APPROVED EQUAL			STAKON BUTT SPLICE, VINYL EXPANDED INSULATION, 16-14 AWG RANGE .# 2RB14X OR APPROVED EQUAL	
17	17	1	CAROL OR APPVD EQUAL	CAT. NO.:16012			LENGTH AS REQUIRED, 2 CONDUCTOR, 18 AWG, 90°C, 600V, SOW	
18	18	1	NOVAGARD	G641	X0078-H01		LOT HEAT TRANSFER COMPOUND	C
19	19	1	SETON CO/ PROVIDED BY DALLAS		X0094-H01		CAUTION SIGN	F
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								

List of Material for Module Top Enclosure Wiring Assembly

600 Willow Tree Rd., Leonia NJ 07605

1. Refer to Drawing # 18000-02-0228
2. It is only for one module.

Drawing Number		Rev	Page
A	18-000-02-0229	F	1 of 1

ITEM#	QTY	DESCRIPTION	MANUF/SUPPL	MODEL#	PART#	OZONIA#	SIZE	MATERIAL	FINISH
-	1	MODULE ASSEMBLY	-		-	18000-02-0228	-	-	

WHERE USED:

AQUARAY 40 HO MODULE ASSEMBLY X0030-H01, X0030-H02, X0030-H03, X0030-H04, X0030-H05, X0030-H06, X0030-H07, X0030-H08, X0030-H15

MANUFACTURER ADDRESS:

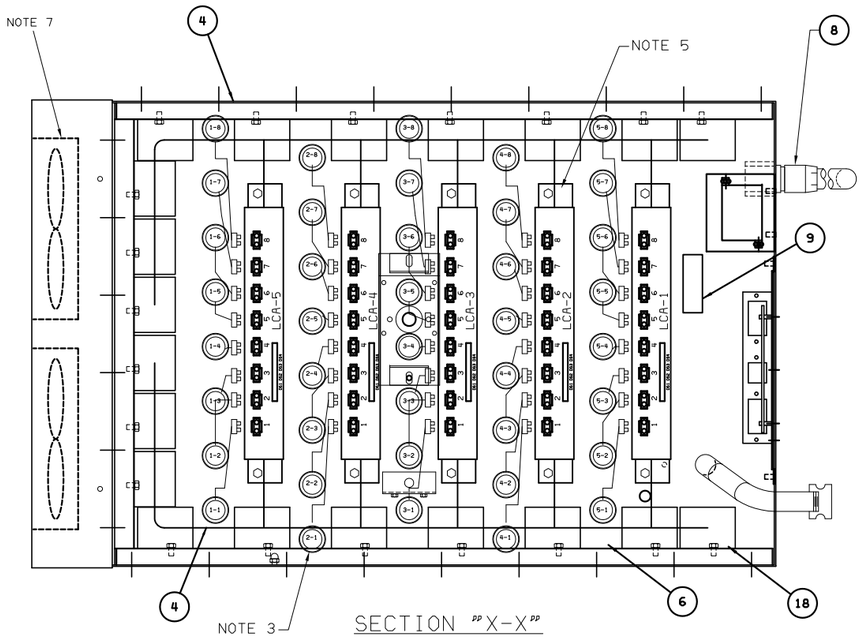
-

SUPPLIER ADDRESS:

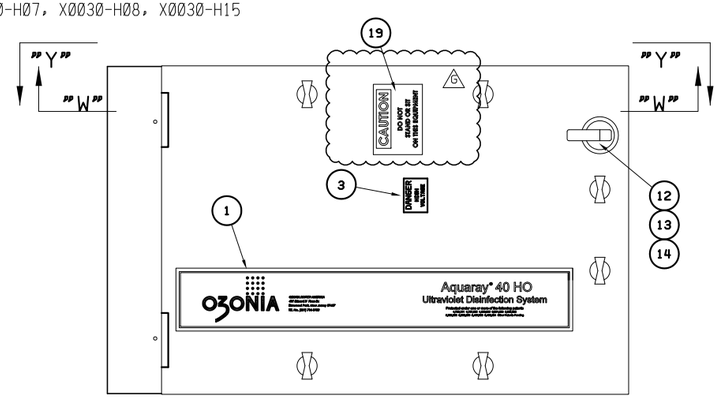
-

SPECIFICATION:

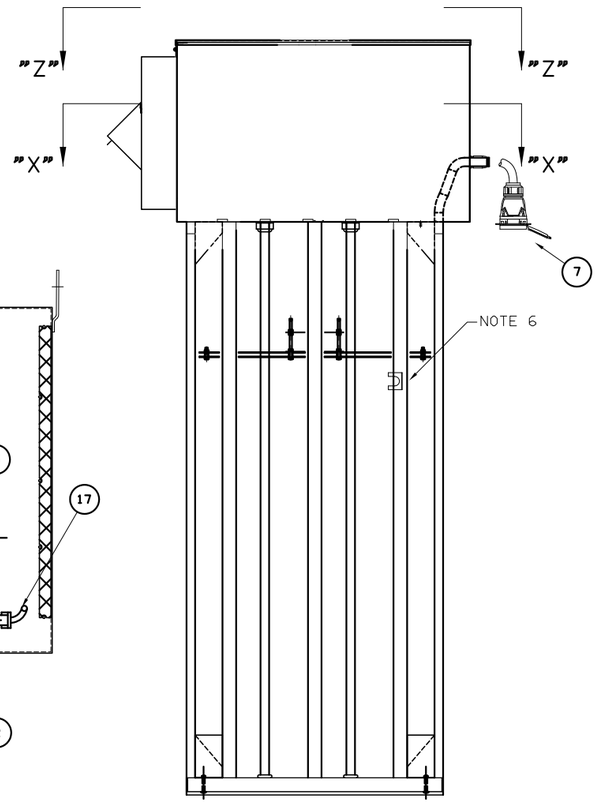
-

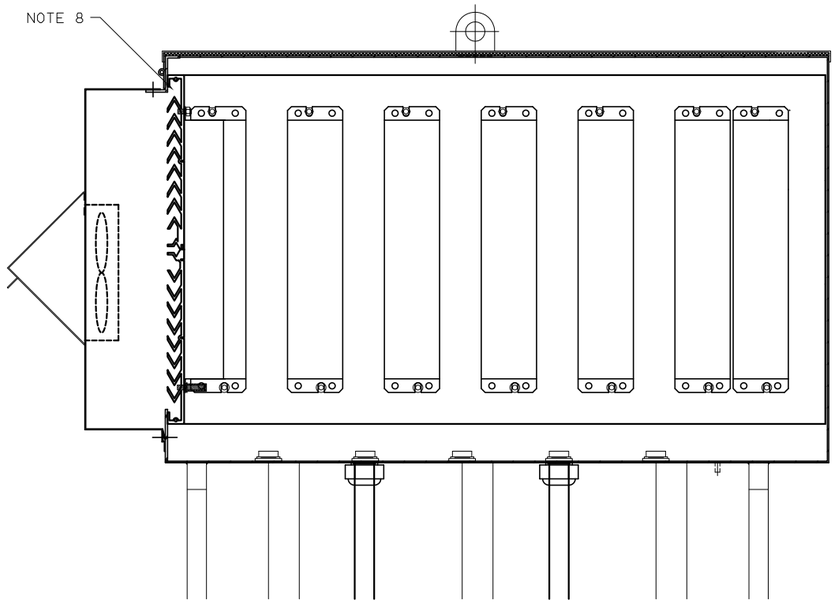


SECTION "X-X"

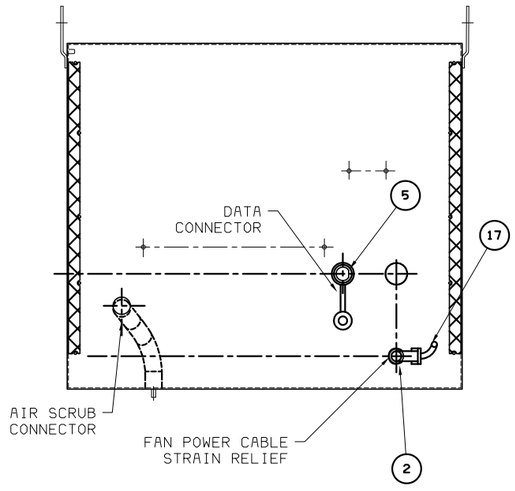


VIEW "Z-Z"





SECTION "Y-Y" (-G01)
(1X LIFTING)



VIEW "W-W"

NOTES:

1. IDI REFERENCES:
   DWG No. 62729 REV. A
2. MODULE WIRING DETAIL REFERS TO PAGE 2 OF 2.
3. QUARTZ JACKET INSTALLATION REFERS TO 18000-77-0049 PAGE 1 OF 4.
4. PHOTOCELL CONNECTOR ASSEMBLY REFERS TO 18000-77-0049 PAGE 2 OF 4.
5. LCA MOUNTING DETAIL REFERS TO 18000-77-0049 PAGE 3 OF 4.
6. BAFFLE WITH SENSOR MOUNTING BRACKET ON ALL HO MODULE TYPES (1) PLACE.
7. FOR FAN ELECTRICAL CONNECTION SEE PAGE 2 OF 2.
8. MOUNTING BALLAST DETAIL REFER TO 18000-77-0049 PAGE 4 OF 4.
9. LIST OF MATERIAL REFER TO 18000-02-0229.

REV.	DESCRIPTION	DRAWN	APPD.	DATE
G	ADDED DO NOT SIT OR STAND WARNING DECAL	MDL	SM	10/24/11
F	DELETED THE WIRING FOR COOLING UNIT	MDL	WY	04/13/07
E	CHANGED COLOR CODE FOR POWER CABLE	MDL	WY	03/09/07

SCALE: NONE
DRAWN: 01/09/06 MDL
CHECKED: 01/09/06 WY
APPROVED:

TITLE: ENCLOSURE COMPONENT ASSEMBLY
MODULE ASSEMBLY
AQUARAY 40, HO UV SYSTEM

OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NEW JERSEY 07605

SHT.: 1 TO 2
SIZE: B
DWG. NO.: 18000-02-0228
REV.: G

ITEM#	QTY	DESCRIPTION	MANUF/SUPPL	MODEL#	PART#	OZONIA#	SIZE	MATERIAL	FINISH
-	1	MODULE ASSEMBLY	-		-	18000-02-0228	-	-	

WHERE USED:

AQUARAY 40 HO MODULE ASSEMBLY X0030-H01, X0030-H02, X0030-H03, X0030-H04, X0030-H05, X0030-H06, X0030-H07, X0030-H08, X0030-H15

MANUFACTURER ADDRESS:

-

SUPPLIER ADDRESS:

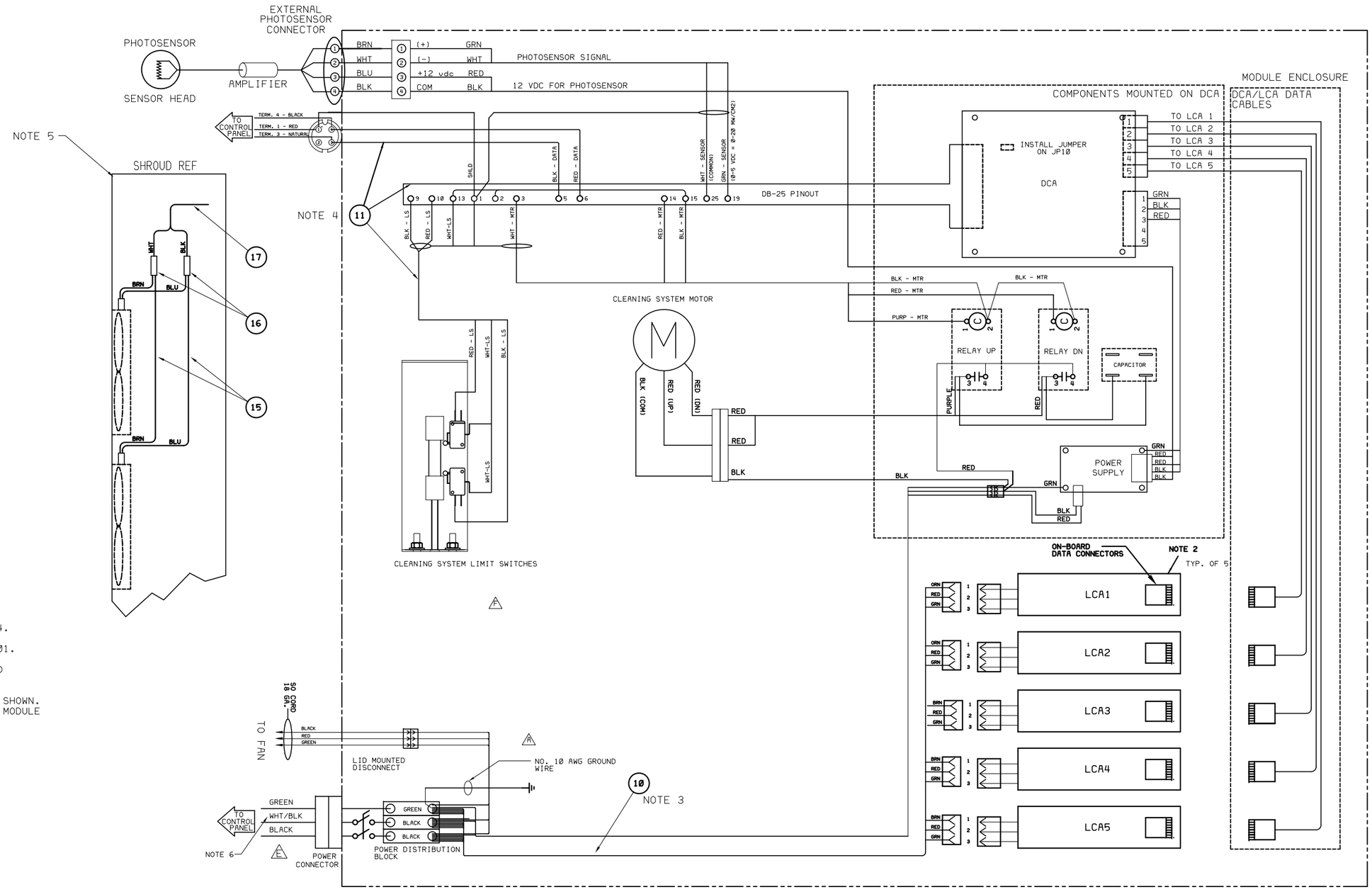
-

SPECIFICATION:

-

NOTES:

1. IDI REFERENCES:
   DWG No. 62729 REV. A
2. LCA ASSEMBLY REFERS TO DWG. 18000-77-0049 PAGE 3 0F 4.
3. POWER DISTRIBUTION HARNESS REFERS TO DRAWING X0054-H01.
4. PHOTOCELL/DATA HARNESS/SRBR/CLEANING SYSTEM REFERS TO DRAWING X0050-H01.
5. BUTT SPLICE FAN: EACH PIGTAILS TO ITEM 14 (CABLE) AS SHOWN. RUN ITEM 14 THROUGH FAN SHROUD ALONG THE SIDE OF THE MODULE AND THROUGH STRAIN RELIEF ITEM 17.
6. THE INCOMING POWER CABLE HAS FOLLOWING COLOR CODE:
   BLACK - PHASE 1
   WHITE (W/ BLACK TAPE) - PHASE 2
   GREEN - GROUND
   REFER TO DWG. # X0051 FOR MORE DETAILS



REV.	DESCRIPTION	DRAWN	APPD.	DATE
G	ADDED DO NOT SIT OR STAND WARNING DECAL	MDL	SM	10/24/11
F	DELETED THE WIRING FOR COOLING UNIT	MDL	WY	04/13/07
E	CHANGED COLOR CODE FOR POWER CABLE	MDL	WY	03/09/07

SCALE: NONE
DRAWN: 01/09/06 MDL
CHECKED: 01/09/06 WY
APPROVED:

TITLE: ENCLOSURE COMPONENT ASSEMBLY
MODULE ASSEMBLY
AQUARAY 40, HO UV SYSTEM

OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NEW JERSEY 07605

SHT.: 2 TO 2
SIZE: B
DWG. NO.: 18000-02-0228
REV.: G

ITEM#	QTY	DESCRIPTION	MANUF/SUPPL	MODEL#	PART#	OZONIA#	SIZE	MATERIAL	FINISH
-	8	DATA CABLE HARNESS	-		-	X0052-H04	-	-	-

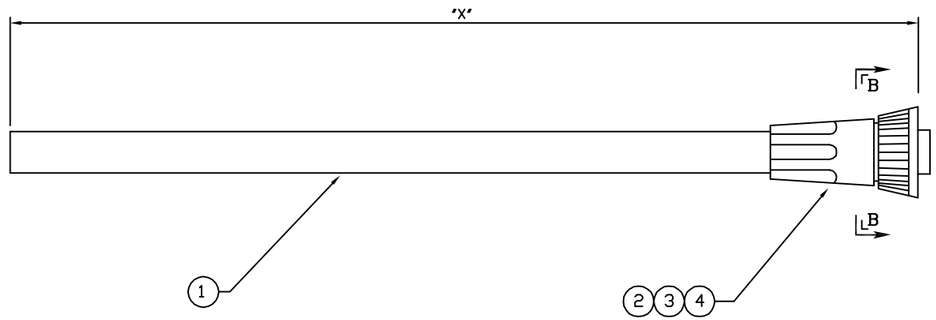
WHERE USED:

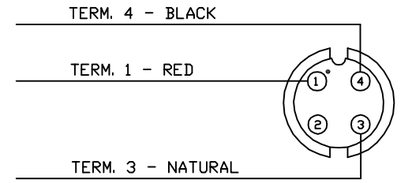
AQUARAY 40 HO MODULE ASSEMBLY X0030-H01

MANUFACTURER ADDRESS:

SUPPLIER ADDRESS:

SPECIFICATION:





SECTION "B-B"

DATA CABLE		
PART NO.	LENGTH "X"	QTY.
X0052-H04	60 FT.	2

NOTES:

1. IDI REFERENCES:
   DWG No. 62717 REV. B
2. ONA TO SUPLLY FULL LENGTH OF POWER AND DATA CABLE FROM MODULE TO REMOTE MONITORING CONTROL CENTER.
3. CONTACTOR MUST VERIFY REQUIRED LENGTH AT APPROVAL.

REV.	DESCRIPTION	DRAWN	APPD.	DATE

SCALE: NONE
DRAWN: 11/08/11 LC
CHECKED: 11/08/11 LC
APPROVED:

TITLE: DATA CABLE HARNESS
AQUARAY "HO" DISINFECTION SYSTEM
FOUNTAIN, CO

OZONIA®
OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NEW JERSEY 07605

SHT.: 1 OF 2
SIZE: B
DWG. NO.: 18253-77-0056
REV.: -

ITEM#	QTY	DESCRIPTION	MANUF/SUPPL	MODEL#	PART#	OZONIA#	SIZE	MATERIAL	FINISH
-	8	POWER CABLE HARNESS	-		-	X0051-H17	-	-	-

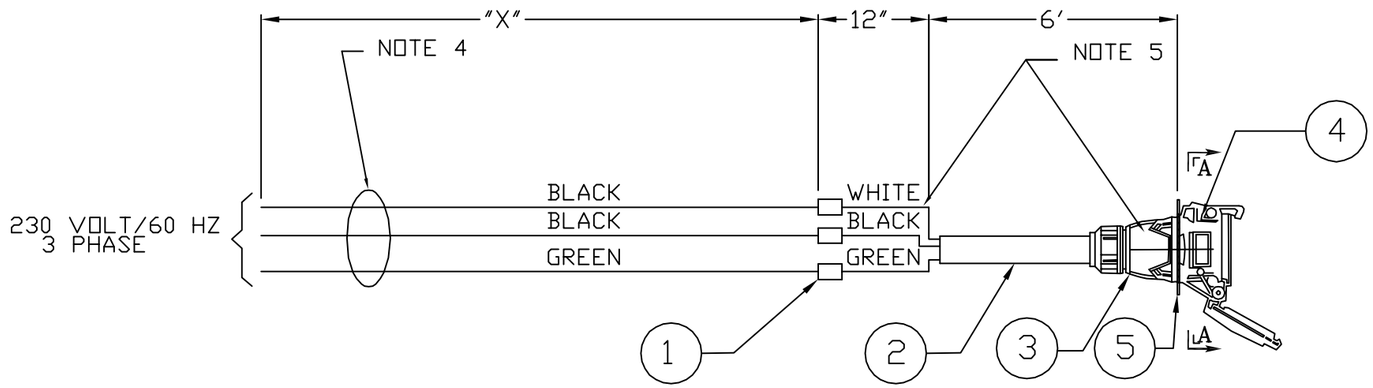
WHERE USED:

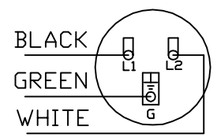
AQUARAY 40 HO MODULE ASSEMBLY X0030-H01

MANUFACTURER ADDRESS:

SUPPLIER ADDRESS:

SPECIFICATION:





SECTION "A-A"

POWER CABLE		
PART NO.	LENGTH "X"	QTY.
X0051-H17	60 FT.	2

NOTES:

1. IDI REFERENCES:
   DWG No. 62717 REV. B
2. ONA TO SUPLLY FULL LENGTH OF POWER AND DATA CABLE FROM MODULE TO REMOTE MONITORING CONTROL CENTER.
3. CONTACTOR MUST VERIFY REQUIRED LENGTH AT APPROVAL.
4. ALL WIRE TO BE 6 AWG.STRANDED COPPER, UL LISTED WITH MTW/THWN2/THHN/AWM INSULATION 600V, COLOR AS INDICATED,
5. WRAP EXPOSED PORTION OF WHITE WIRE WITH BLACK TAPE AT TERMINATIONS.

REV.	DESCRIPTION	DRAWN	APPD.	DATE

SCALE: NONE
DRAWN: 11/08/11 LC
CHECKED: 11/08/11 LC
APPROVED:

TITLE: POWER CABLE HARNESS
AQUARAY "HO" DISINFECTION SYSTEM
FOUNTAIN, CO

OZONIA®
OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NEW JERSEY 07605

SIZE: B
DWG. NO.: 18253-77-0056
REV.: -
SHT.: 2 OF 2

ITEM#	QTY	DESCRIPTION	MANUF/SUPPL	MODEL#	PART#	OZONIA#	SIZE	MATERIAL
-	1	MODULE LIFTING MECHANISM LAYOUT 1X	-		-	18000-77-0100	-	-

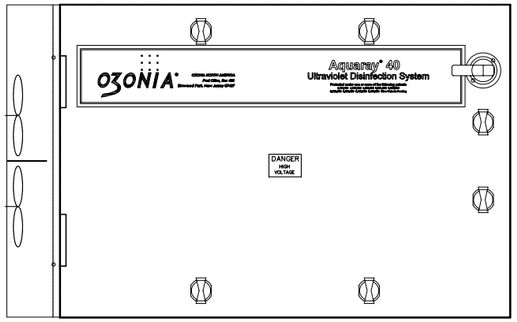
WHERE USED:

AQUARAY 40 HO MODULE ASSEMBLY X0030-H01, X0030-H02, X0030-H05, X0030-H06

MANUFACTURER ADDRESS:

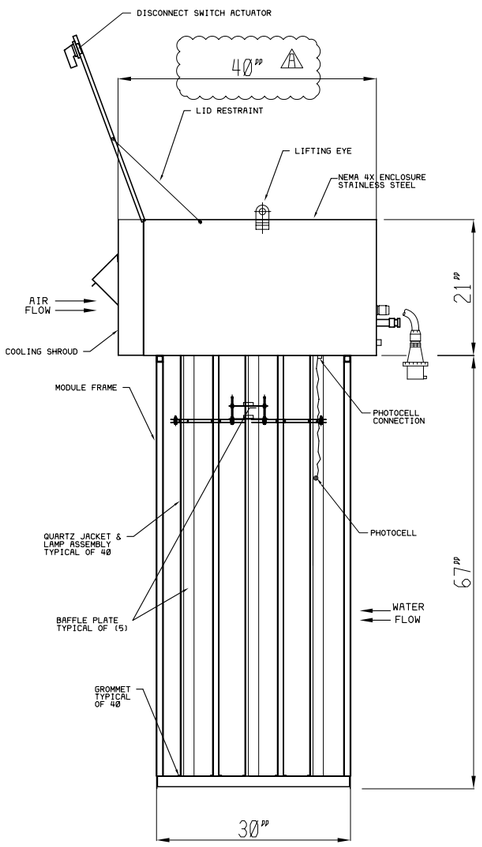
SUPPLIER ADDRESS:

SPECIFICATION:

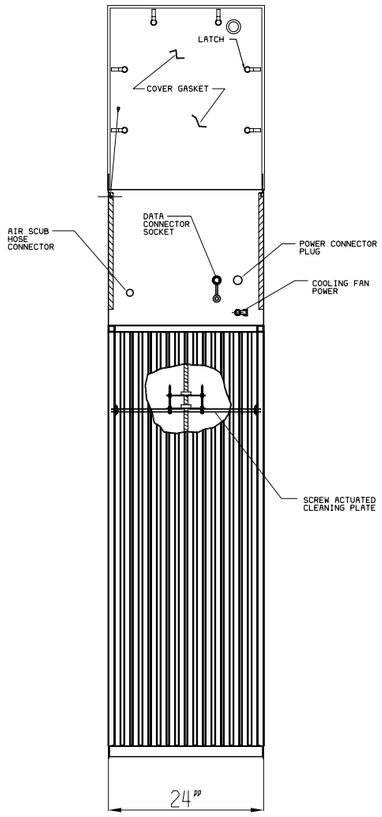


TOP VIEW

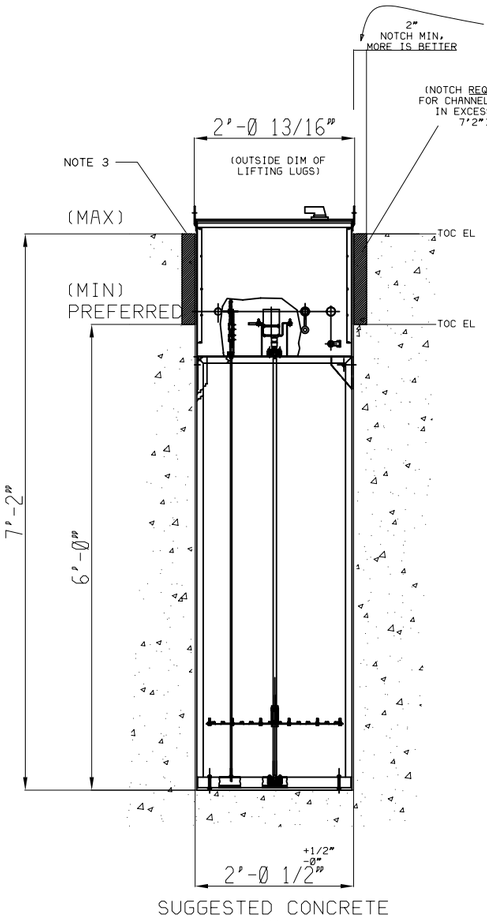
(NOT TO SCALE)



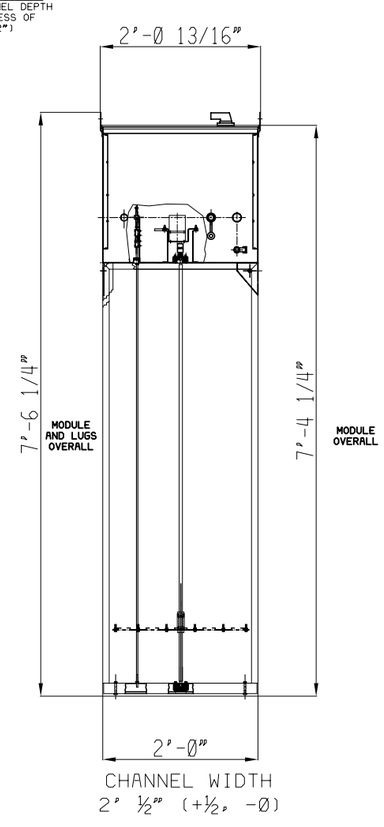
SIDE VIEW



FRONT VIEW



SUGGESTED CONCRETE LAYOUT



CHANNEL WIDTH
2' ½" (+½, -0)

NOTES:

1. IDI REFERENCES:
   DRAWING No. 61877 REV. C.
2. UNLESS OTHERWISE SPECIFIED ALL DIMENSION ARE IN INCHES.
3. NOTE: IF TOP OF CONCRETE ELEVATION IS LESS THAN 7'-2" THE TOP OF THE MODULE WILL BE ABOVE THE ELEVATION OF THE SURROUNDING CONCRETE. IF THE TOP OF CONCRETE ELEVATION IS GREATER THAN 7'-2" NOTCHES WILL BE REQUIRED TO ACCOMODATE LIFTING DEVICE FOR 1X

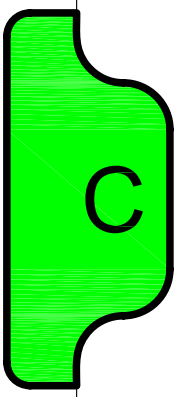
REV.	DESCRIPTION	DRAWN	APPD.	DATE
A	ADDED DIMENSION	MDL	BM	12/10/07

SCALE: NONE
DRAWN: 11/09/05 MDL
CHECKED: 11/09/05 WY
APPROVED:

TITLE:
MODULE LIFTING MECHANISM LAYOUT 1X
TYPE "HO" MODULE ASSEMBLY (5 BAFFLES)
AQUARAY 40 HO DISINFECTION SYSTEM

OZONIA®
OZONIA NORTH AMERICA
Post Office Box 455
Elmwood Park, New Jersey 07407

SHT.: 1 OF 1
SIZE: B
DWG. NO.: 18000-77-0100
REV.: A


C

#	Tag No.	Qty	Manufacturer	Manufacturer #	Ozonia #	Source #	Description	Rev.
1	PDDC_Encl	1	Hoffman	A48H3612SSLP3PT			Enclosure Floor Mounted with 3 point latch, SS304, 48"X36"X12", NEMA 4X	
2	PDDC_Encl	1	Hoffman	A-48P36			Painted Steel Sub Panel, 45"X33"	
3	PDDC_Encl	1	Hoffman	AFK2412SS			Floor Stand Kit, 24"X12.06"X9.09", UL Listed	
4	PDDC_Encl	1	Hoffman	A-DSTOPK			Door Stop Kit, UL Listed	
5	242LT	1	Hoffman	LF120V18			18" Fluorescent Enclosure Light, 120 VAC	
6	242LT	1	Hoffman	F8T5			Fluorescent Bulb for 18" Fluorescent Enclosure Light, UL Listed	
7	245HTR	1	Hoffman	D-AH4001B			Enclosure Heater with Fan, 400 W, 115 VAC, 3.3 Amps	
8	PLC_CHS	1	Allen Bradley	1746-A7			7 Slot Chassis, UL Listed	
9	PLC_CPU	1	Allen Bradley	1747-L552			SLC 5/05 CPU, 32 K Memory with Ethernet and RS 232 Com Ports, UL Listed	
10	PLC_MEM	1	Allen Bradley	1747-M13			Memory Module, 64K For SLC 5/05	
11	PLC_PS	1	Allen Bradley	1746-P2			PLC Power Supply, UL Listed	
12	PLC_AI	1	Allen Bradley	1746-NI4			Analog Input, 4 PT, UL Listed	
13	PLC_DI	1	ALLEN BRADLEY	1746-IA4			4 Channel Digital Input Module, 120 VAC	
14	PLC_MVI	1	Prosoft	MVI46-ADM			MVI 46, MultiVendor Comm. Module for A/B SLC 5/05	
15	PLC_FIL	3	Allen Bradley	1746-N2			FILLER, UL Listed	
16	256-PV	1	Hoffman	AWDH2420N4SS			Hoffman Window Panel Kit, NEMA 4X	
17	256-PV	1	Allen Bradley	2711P-T10C4D1			PanelView Plus 1000, 10" Touch Screen Display, Ethernet and RS232, 24VDC UL Listed	
18	ETH-1,2	2				Shop	Ethernet Cable with RJ-45 conectors at both ends, shop to make required length	
19	ES-1	1	Phoenix Contact	2891152			Ethernet Switch, 5 RJ-45 ports, 24 VDC	
20	214CB	1	ABB	S201-C8			Circuit Breaker, 115 VAC, 8 Amps, Single Pole	
21	CB-254	1	ABB	S201-C2			Circuit Breaker, 115 VAC, 2 Amps, Single Pole	
22	CB-255	1	ABB	S201-C6			Circuit Breaker, 115 VAC, 6 Amps, Single Pole	
23	254-PS	1	Siemens	6EP1 333-3BA00			Sitop, DC Power supply, 88-132 vac input, 24 vdc, 5 amp out	
24	311-COS	1	B&B Electronics	232IDXSS	X0072HO1		Code Operated Switch Box, Eight Port Master Switch with one RS 232 Master Port and Eight RS422/485 Slave Ports	
25	311-COS	1	L-COM	TRD855-5			Cat 5 Cable 5 Ft. Length with RJ 45 Connector At Each End, for Connecting MVI#1 & 2 To 126 & 146COS	
26	311-COS	1	L-COM	RA258M			L-COM Modular Adaptor, (DB25M TO RJ45)	

Power & Data Distribution Center - List of Materials
Fountain, CO

OZONIA NORTH AMERICA
600 Willow Tree Road, Leonia NJ 07605

1. Refer to Panel Layout Drawing # 18253-02-0200
2. Refer to Electrical Schematic Diagram # 18253-77-0050

Drawing Number		Rev	Page
A	18253-02-0226		1 of 2

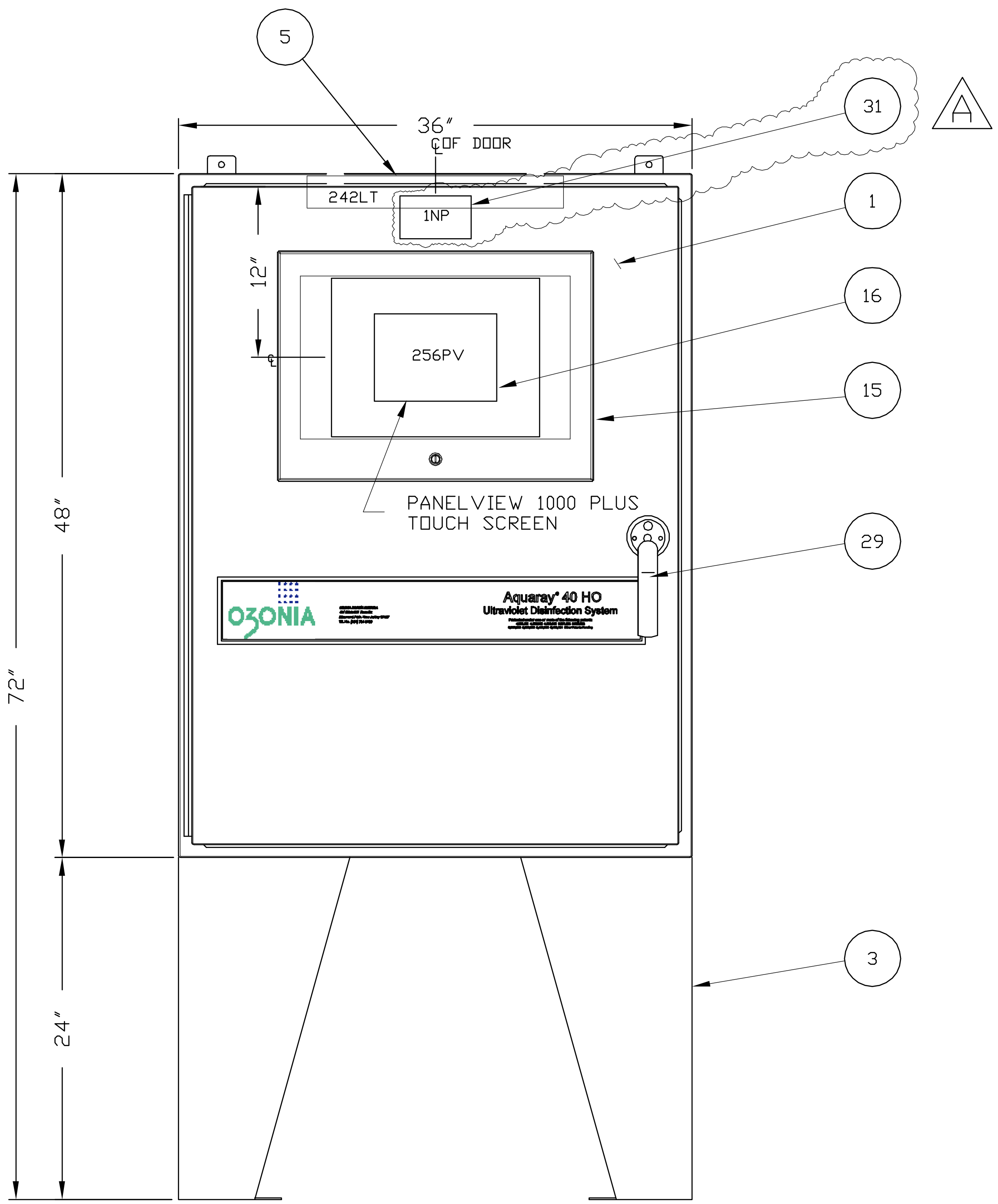
#	Tag No.	Qty	Manufacturer	Manufacturer #	Ozonia #	Source #	Description	Rev.
27	311-COS	2	GC Electronics	41-1311			DB25M (Male) Sub-Miniature Solder Cup, Fully Populated Connectors	
28	311-COS	2	GC Electronics	45-5008			Color Coded D-SubMiniature Plastic Hood For DB25M Connector	
29	311-COS	1		59972-H01	X0073HO1	Shop	304 SS, Bracket Mounting for 8 Port Code Operated Switch	
30	Decal	1	Ozonia		X0053HO1		Ozonia Nameplate	
31	1NP, 2NP	2	Ozonia		18253-02-0238	Shop	Nameplates	
32		A/R	Alpha Cable	2403C			Low Capacitance Cable	
33	250SS	1	Islatrol	IC-107			Surge Suppressor, 120 VAC, 7 Amps	
34	212-TRF	1	ACME	TB-81216			Industrial Control Transformer, 750 VA, 230/120, UL listed	
35	Load Center 1	1	Square D	QO320L125G			Lug Panel, 20 Ckt,125 A, 3Phase,4-Wire with Gnd. Bar, UL 489	
36	Load Center 1	1	Square D	QOC24US			Indoor Cover, UL Listed	
37	1CB-A	1	Square D	QO380			Circuit Breaker, 3 Pole, 80 Amps, 230VAC, UL 489	
38	2CB-A; 6CB-A	2	Square D	QO240HID			Circuit Breaker, 2 Pole, 40 Amps, 230VAC, UL 489	
39	9CB-A	1	Square D	QO210			Circuit Breaker, 2 Pole, 10 Amps, 230VAC, UL 489	
40	Surge Breaker A,B	2	Square D	Q02175SB			2 Pole Plug ON, Surge Arrestor, 175 VAC, UL 489	
41	269-REC	1	Weidmueller	6720005421			120V/15A Duplex Receptacle, Din rail mountable	
42	274-REC	1	Weidmueller	6720005422			120V/15A Duplex GFCI Receptacle, Din rail mountable	
43	Wireway	A/R	HellermannTyton	PO293033			1"W X 3"H, White Wireway Duct	
44	Wireway	A/R	HellermannTyton	PO293026			1"W X 3"H, Snap On Cover for the Wireway Duct	
45	Wireway	A/R	HellermannTyton	PO293019			2"W x 3"H, White Wireway Duct	
46	Wireway	A/R	HellermannTyton	PO293027			2"W X 3"H, Snap On Cover for the Wireway Duct	
47	TB	56	Weidmueller	102000			Terminal Block, WDU 2.5	
48	TBE	18	Weidmueller	106120			Terminal Block End Barriers	
49	TB_G	4	Weidmueller	101000			Ground Terminal Block, Green/Yello Wemid, UL rated #22…12 AWG	
50								

Power & Data Distribution Center - List of Materials
Fountain, CO

OZONIA NORTH AMERICA
600 Willow Tree Road, Leonia NJ 07605

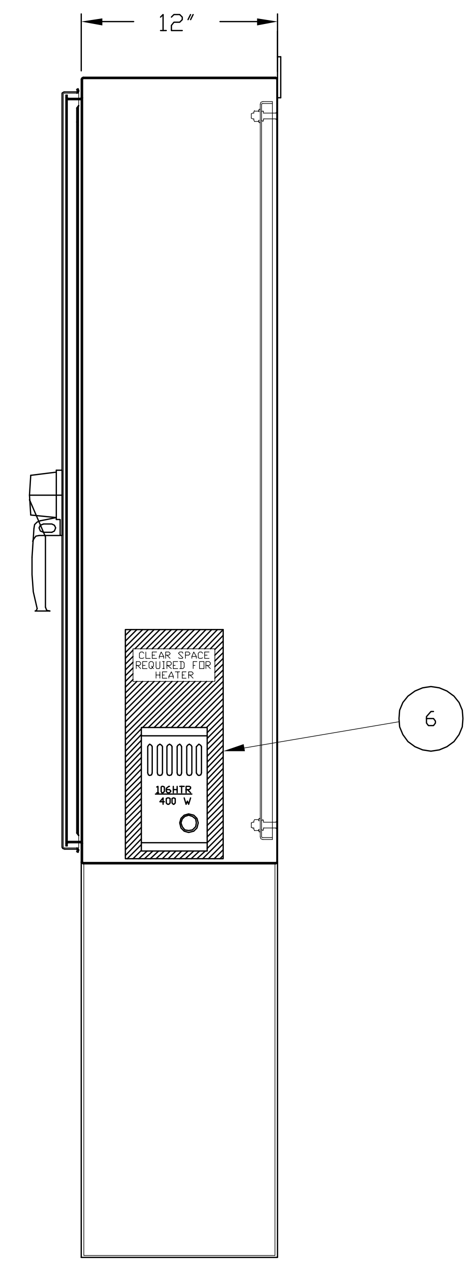
1. Refer to Panel Layout Drawing # 18253-02-0200
2. Refer to Electrical Schematic Diagram # 18253-77-0050

Drawing Number	Rev	Page
A **18253-02-0226**		**2 of 2**



FRONT VIEW

(48"H x 36"W x12"D) NEMA 4X 304SS
HOFFMAN # A-48H3612SSLP3PT



RIGHT VIEW

NOTES:

1. FOR ASSEMBLY WIRING DIAGRAMS, SEE DRAWINGS: 18253-77-0050.
2. FOR LIST OF NAMEPLATES REFER TO DWG. #18253-02-0238.

REV.	DESCRIPTION	DRAWN	APPD.	DATE
A	CHANGED NOMENCLATURE	DE	DV	4/24/12

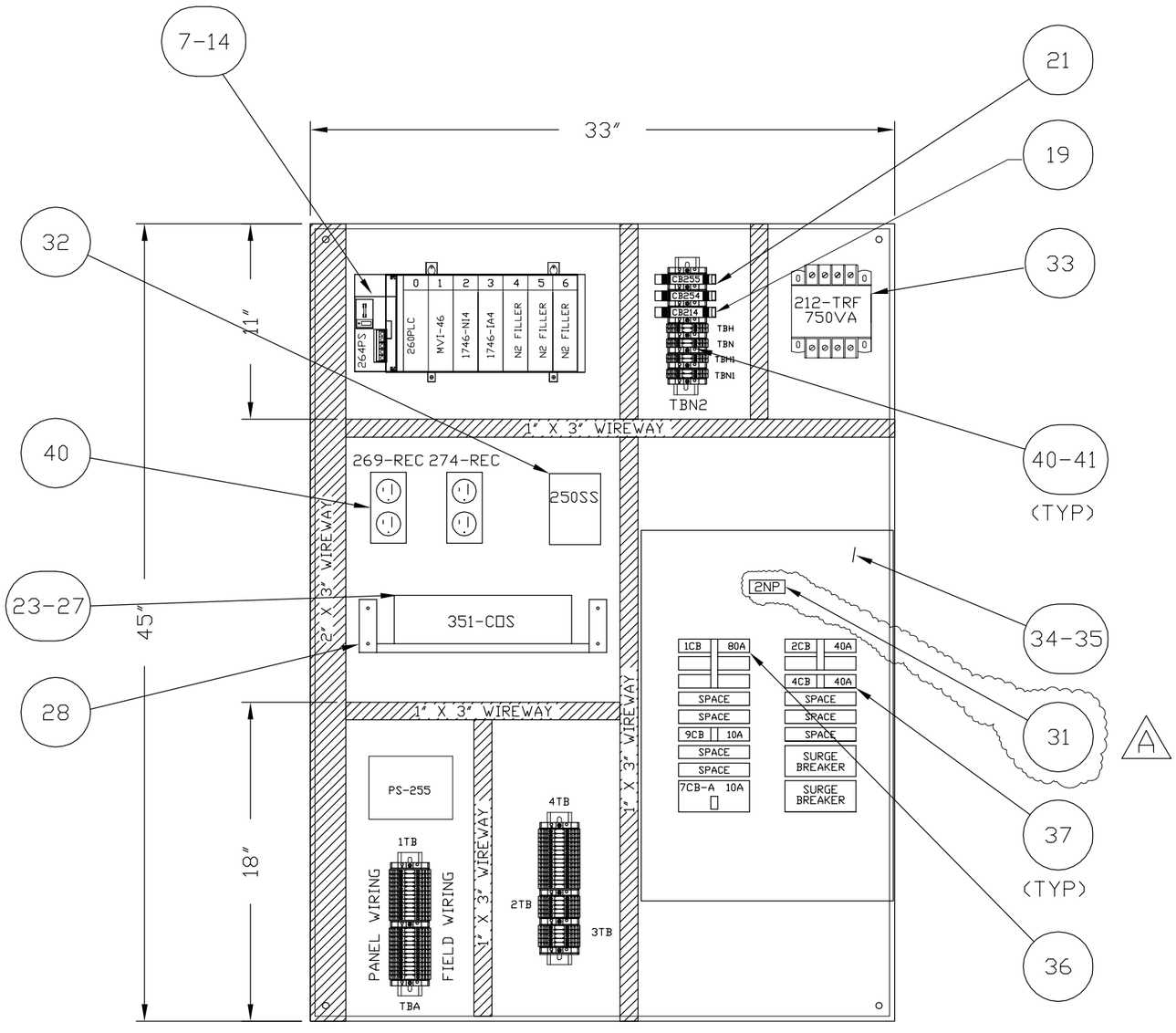
SCALE: NONE
DRAWN: 11/04/11 EDN
CHECKED: 11/04/11 PG
APPROVED:

TITLE: PDDC CABINET LAYOUT
AQUARAY "HO" DISINFECTION SYSTEM
FOUNTAIN, CO

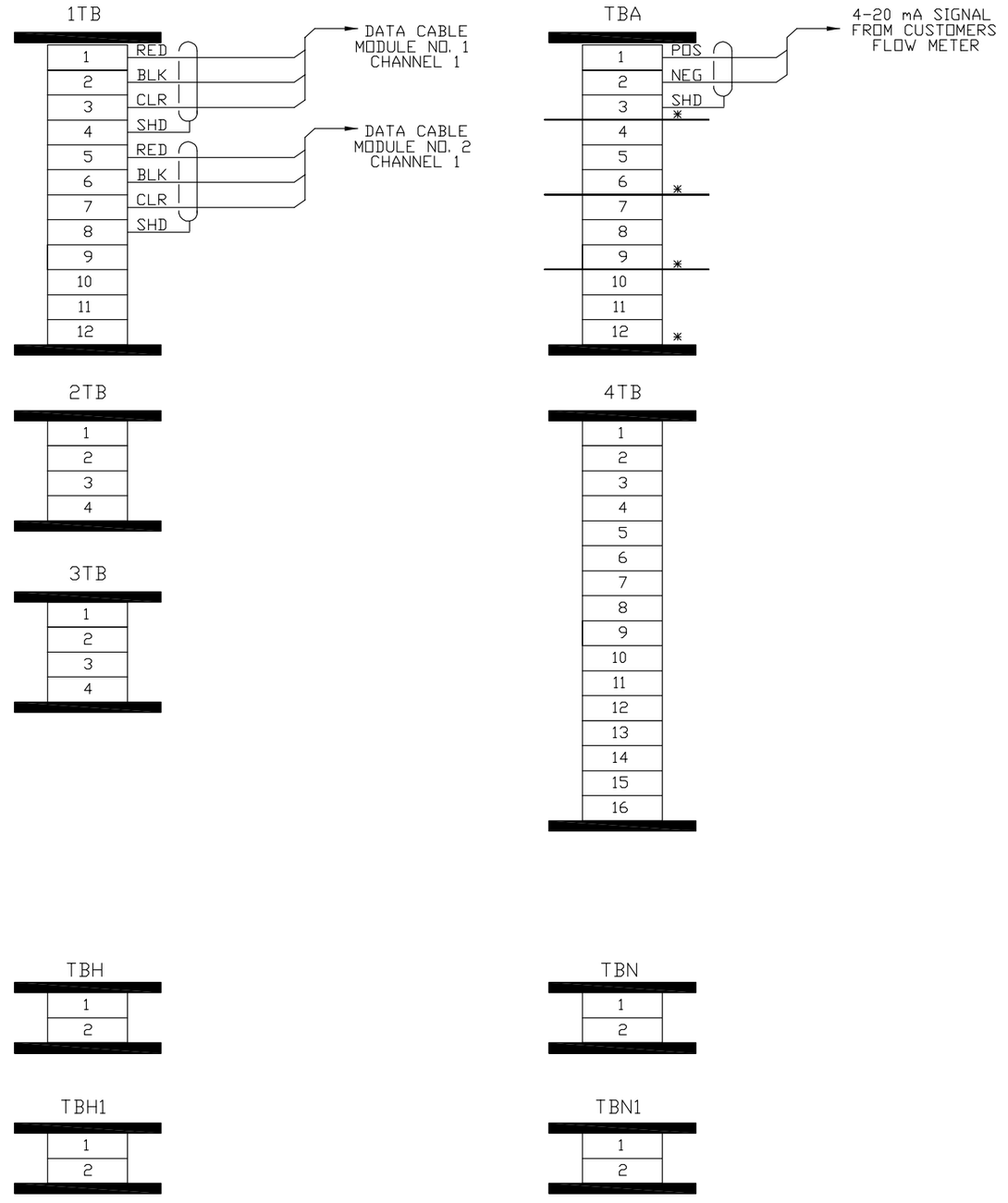
OZONIA
OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NEW JERSEY 07605

SHT.: 1 OF 2
SIZE: B
DWG. NO.: 18253-02-0200
REV.: A

Date: Apr 24, 2012 – 11:05am User: eymoldd File: C:\Degremont Vault\ONA\Contracts\18,000's\2011\31811253 Fountain,CO – Harold D. Thompson WRF\Drawings\0202\18253-02-0200.dwg



FRONT PANEL



FIELD WIRING

REV.	DESCRIPTION	DRAWN	APPD.	DATE
A	CHANGED NOMENCLATURE	DE	DV	4/24/12

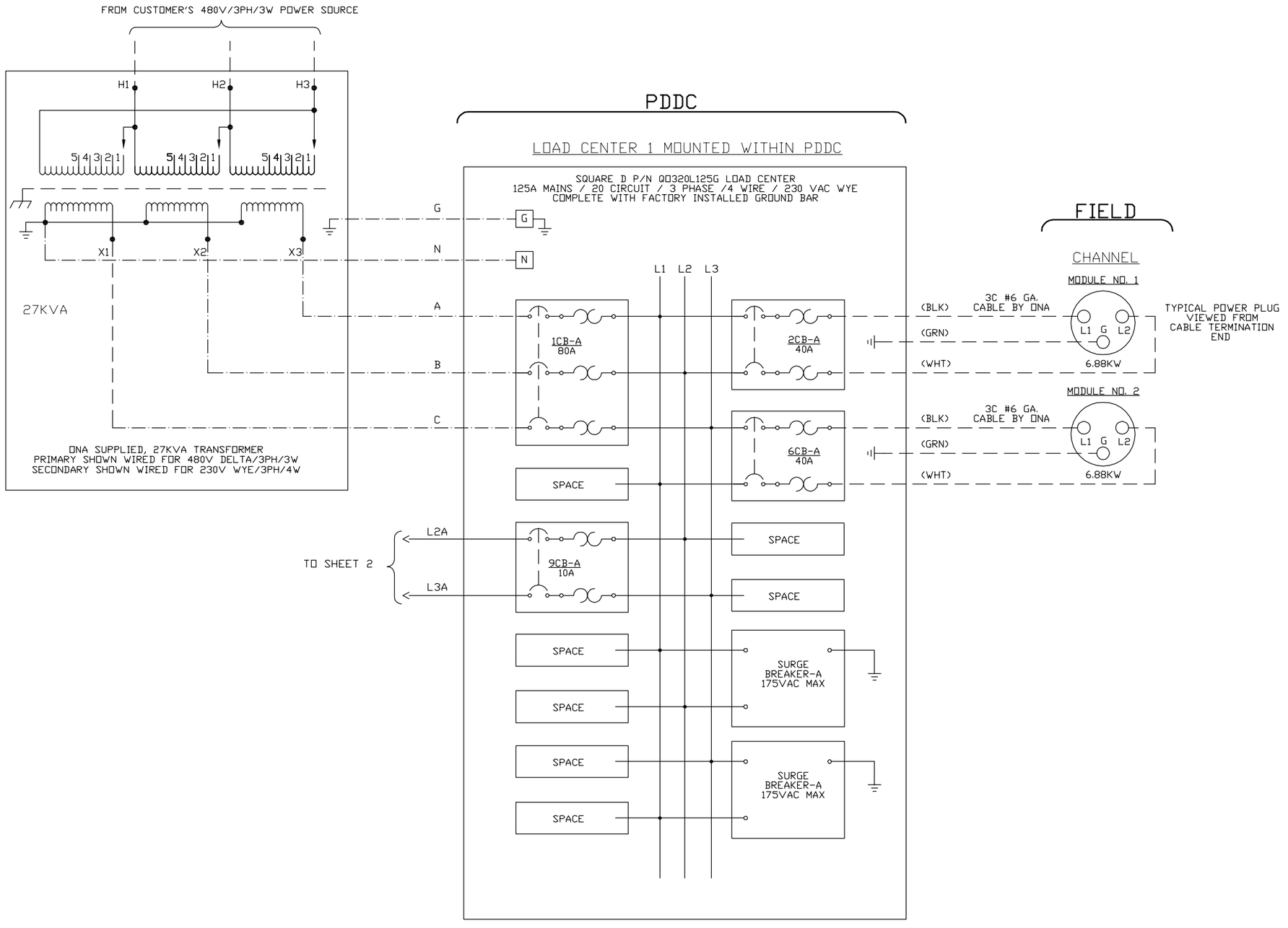
SCALE: NONE
DRAWN: 11/04/11 EDN
CHECKED: 11/04/11 PG
APPROVED:

TITLE: PDDC CABINET LAYOUT
AQUARAY "HO" DISINFECTION SYSTEM
FOUNTAIN, CO

OZONIA
OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NEW JERSEY 07605

SHT.: 2 OF 2
SIZE: B
DWG. NO.: 18253-02-0200
REV.: A

Date: Apr 24, 2012 – 11:05am User: eymoldd File: C:\Degremont Vault\ONA\Contracts\18,000's\2011\31811253 Fountain,CO – Harold D. Thompson WRF\Drawings\0202\18253-02-0200.dwg



NOTES:

1. POWER CABLE COLOR CODE AT MODULE END.

BLACK	–	PHASE 1
WHITE(W/BLACK TAPE)	–	PHASE 2
GREEN	–	GROUND

2. CONTRACTOR TO PROVIDE A 80A CIRCUIT BREAKER AT THE TRANSFORMER SECONDARY IF THE DISTANCE FROM PDDC IS MORE THAN 10FT. PER NEC ARTICLE 240.21.(C).(2)

3. ALL WIRING TO BE 16AWG THHN OR EQUAL UNLESS OTHERWISE SPECIFIED.

4. WIRE COLORS TO BE:

120 POWER	–	BLACK
220 VAC PH1	–	BLACK
220 VAC PH2	–	BLACK
220 VAC PH3	–	BLACK
CONTROLS	–	RED
24VDC	–	BLUE
DRY CONTACT	–	ORANGE
NEUTRAL	–	WHITE
GROUND	–	GREEN
2/C CABLE (+)	–	RED
2/C CABLE (–)	–	BLACK
2/C CABLE (SHIELD)	–	BARE

5. REFER TO DWG. # 18253-02-0226 FOR LIST OF MATERIAL.

6. _____ PANEL WIRING (BY OZONIA)

   ETHERNET CABLE (BY OZONIA)

   WIRES PROVIDED AND FIELD INSTALLED (BY OTHERS)

   CABLE BY OZONIA FIELD INSTALLED BY OTHERS

REV.	DESCRIPTION	DRAWN	APPD.	DATE

SCALE: NONE
DRAWN: 11/04/11 EDN
CHECKED: 11/04/11 PG
APPROVED:

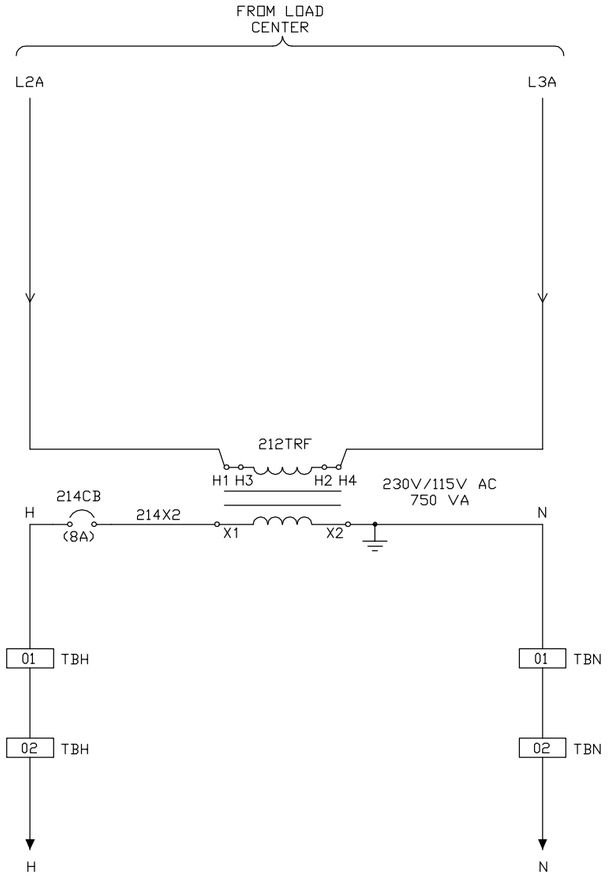
TITLE: SCHEMATIC WIRING DIAGRAM
AQUARY "HO" DISINFECTION SYSTEM
FOUNTAIN, CO

OZONIA
OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NEW JERSEY 07605

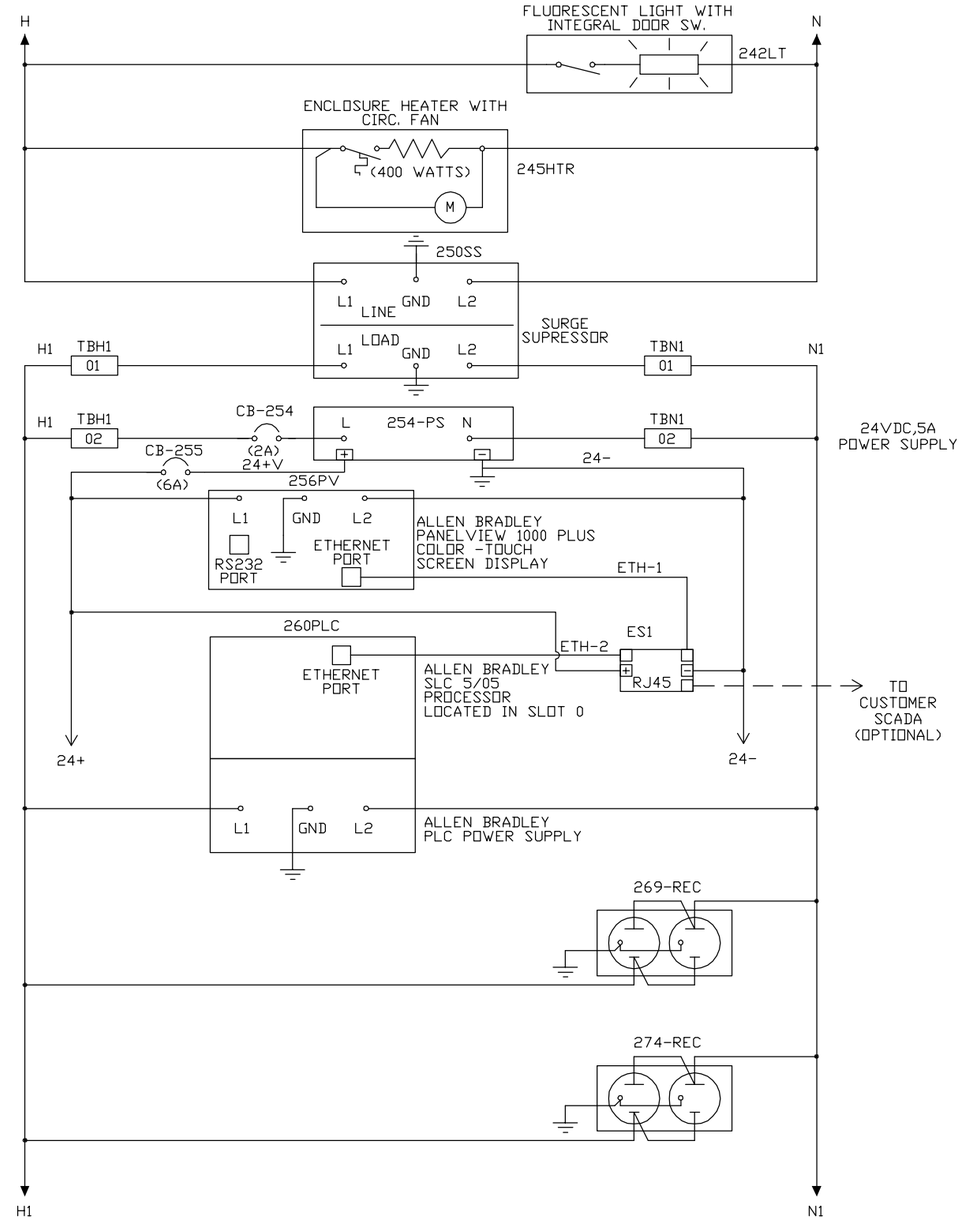
SHT.: 1 NEXT 2
SIZE: B
DWG. NO.: 18253-77-0050
REV.: –

Date: Nov 07, 2011 – 3:29pm User: nuneze File: C:\Degremont Vault\ONA\Contracts\18,000's\2011\31811253 Fountain,CO – Harold D. Thompson WRF\Drawings\7700\18253-77-0050.dwg

PDDC



PDDC



REV.	DESCRIPTION	DRAWN	APPD.	DATE

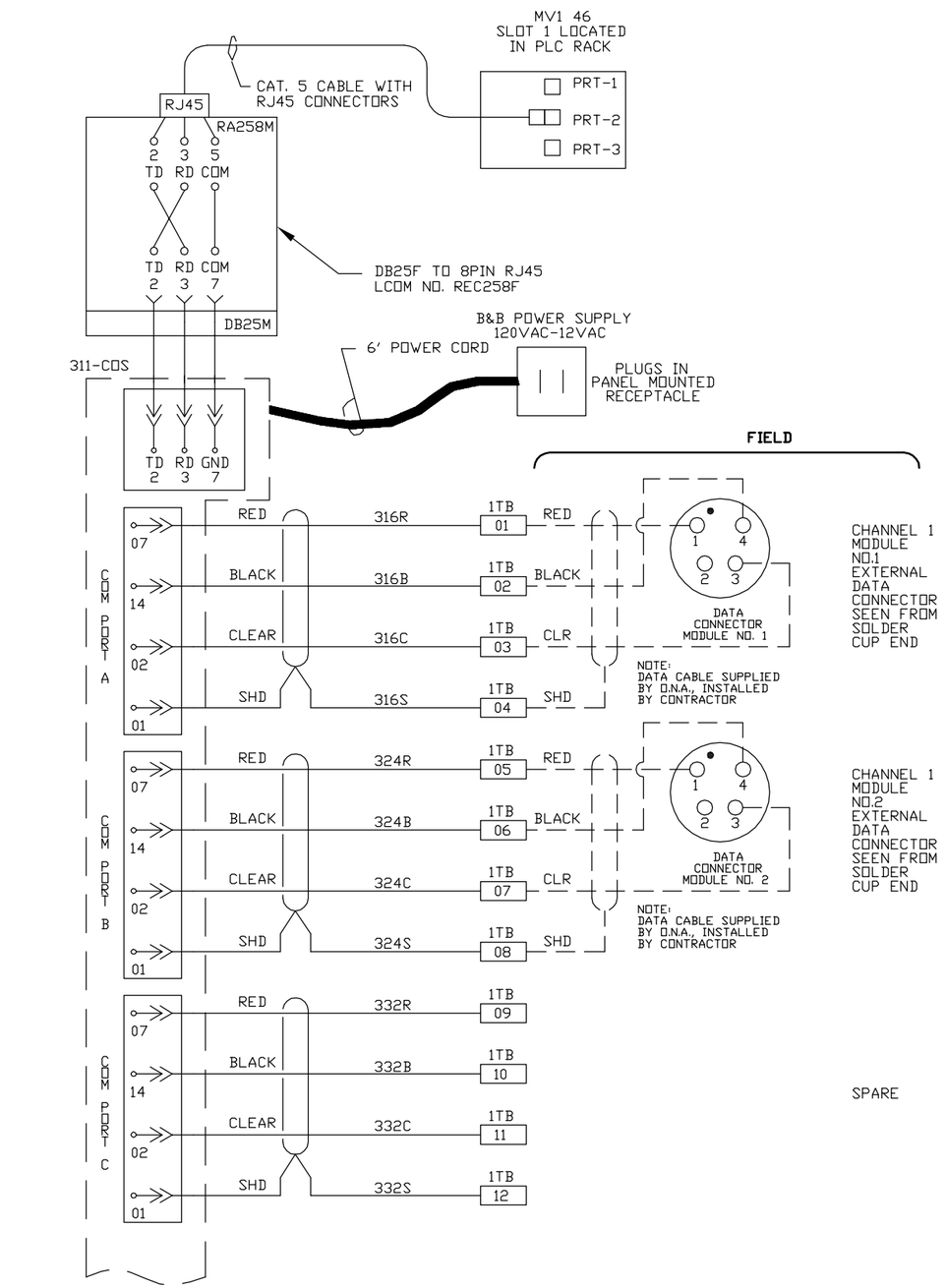
SCALE: NONE
DRAWN: 11/04/11 EDN
CHECKED: 11/04/11 PG
APPROVED:

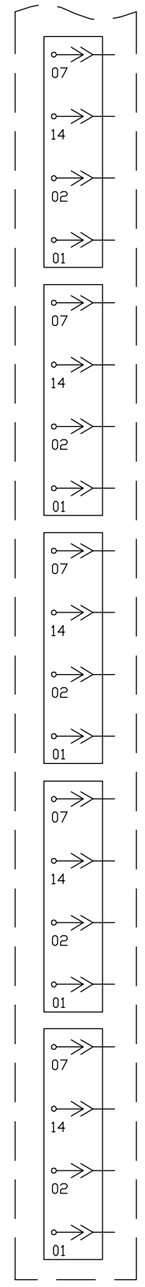
TITLE: SCHEMATIC WIRING DIAGRAM
AQUARY "HO" DISINFECTION SYSTEM
FOUNTAIN, CO

OZONIA
OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NEW JERSEY 07605

SHT.: 2 NEXT 3
SIZE: B
DWG. NO.: 18253-77-0050
REV.: -

Date: Nov 07, 2011 – 3:29pm User: nuneze File: C:\Degremont Vault\ONA\Contracts\18,000's\2011\31811253 Fountain,CO – Harold D. Thompson WRF\Drawings\7700\18253-77-0050.dwg





REV.	DESCRIPTION	DRAWN	APPD.	DATE

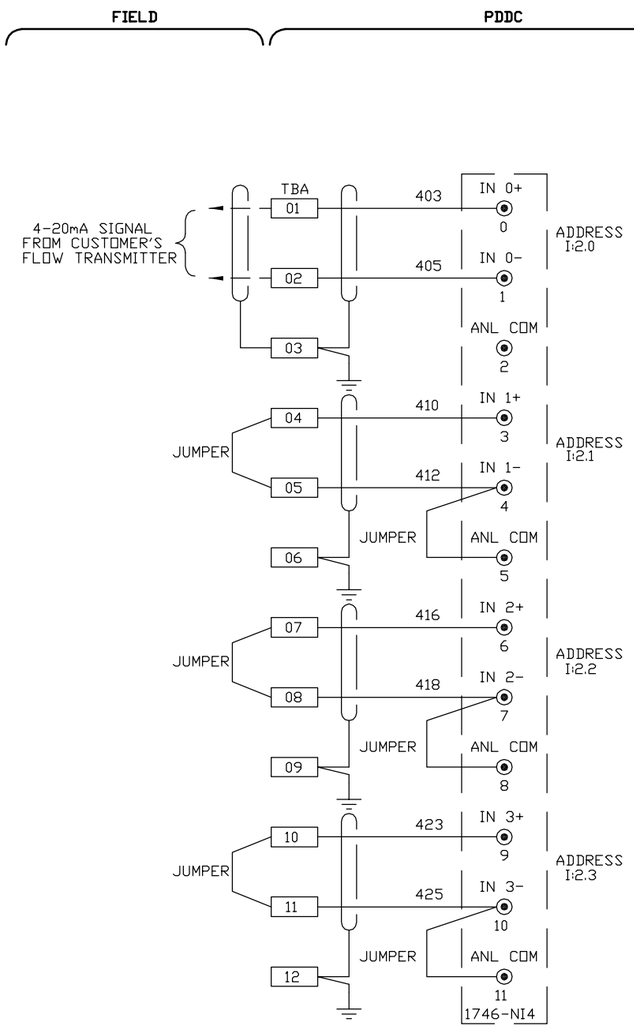
SCALE: NONE
DRAWN: 11/04/11 EDN
CHECKED: 11/04/11 PG
APPROVED:

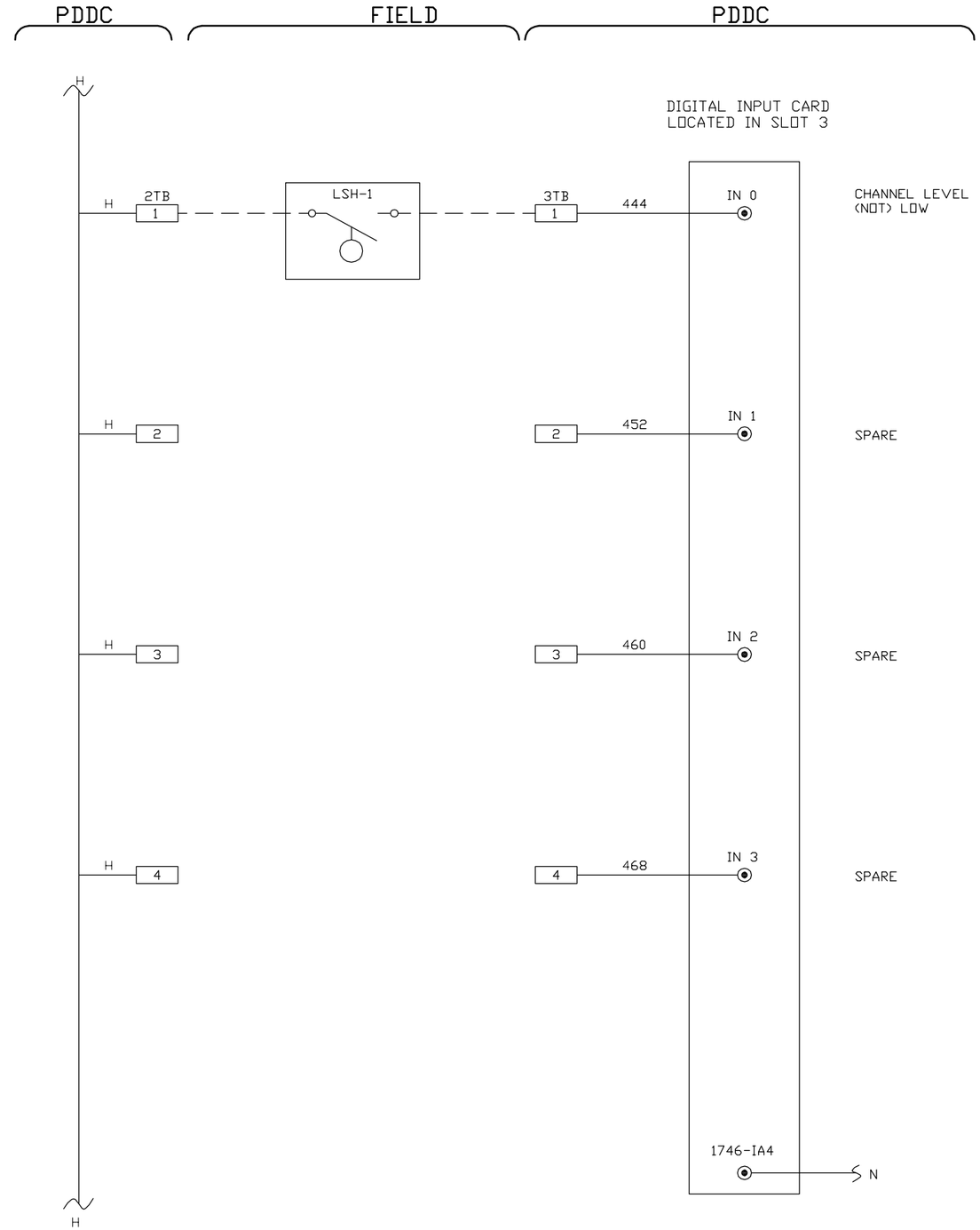
TITLE: SCHEMATIC WIRING DIAGRAM
AQUARY "HO" DISINFECTION SYSTEM
FOUNTAIN, CO

OZONIA
OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NEW JERSEY 07605

SIZE: B
DWG. NO.: 18253-77-0050
REV.: -
SHT.: 3 NEXT 4

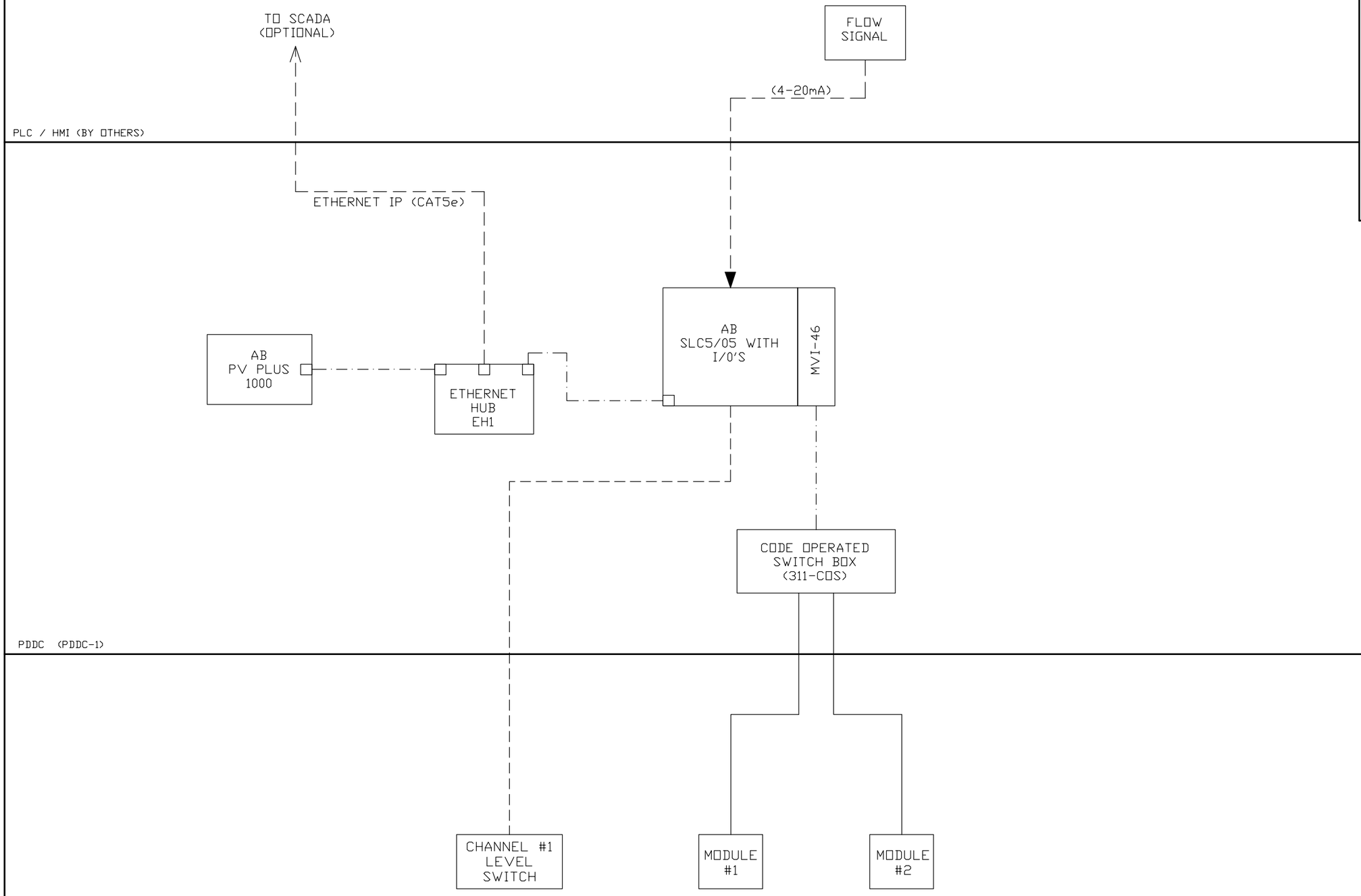
Date: Nov 07, 2011 – 3:29pm User: nuneze File: C:\Degremont Vault\ONA\Contracts\18,000's\2011\31811253 Fountain,CO – Harold D. Thompson WRF\Drawings\7700\18253–77–0050.dwg





					SCALE: NONE	TITLE: SCHEMATIC WIRING DIAGRAM AQUARY "HO" DISINFECTION SYSTEM FOUNTAIN, CO	OZONIA NORTH AMERICA 600 WILLOW TREE ROAD LEONIA, NEW JERSEY 07605
					DRAWN: 11/04/11 EDN		SHT.: 4 NEXT END
					CHECKED: 11/04/11 PG		SIZE: B / DWG. NO.: 18253-77-0050 / REV.: -
REV.	DESCRIPTION	DRAWN	APPD.	DATE	APPROVED:		

Date: Nov 07, 2011 – 3:30pm User: nuneze File: C:\Degremont Vault\ONA\Contracts\18,000's\2011\31811253 Fountain,CO – Harold D. Thompson WRF\Drawings\7700\18253-77-0050.dwg



NOTE

1. LEGEND

— — — : CABLE & FIELD WIRING (BY OTHERS).

——————— : CABLES ARE PROVIDED BY OZONIA. FIELD WIRING BY OTHERS

— · — · — : PANEL WIRING (BY OZONIA).

2. FOLLOWING IP ADDRESS TO BE USED:

PLC - 192.168.0.1
PV PLUS1000 - 192.168.0.2
SUBNET MASK - 255.255.255.0

REV.	DESCRIPTION	DRAWN	APPD.	DATE
A	REVISED PER ENGINEER'S COMMENTS DATED 03/12/12	HD	PG	04/10/12

SCALE: NONE
DRAWN: 11/04/11 EDN
CHECKED: 10/04/11 HG
APPROVED:

TITLE: CONTROL ARCHITECTURE BLOCK DIAGRAM FOUNTAIN, CO

OZONIA
OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NEW JERSEY 07605

SHT.: 1 NEXT END
SIZE: B
DWG. NO.: 18253-77-0227
REV.: A

Date: Apr 11, 2012 - 9:27am User: devineh File: C:\Degremont Vault\ONA\Contracts\18,000's\2011\31811253 Fountain,CO - Harold D. Thompson WRF\Drawings\7702\18253-77-0227.dwg

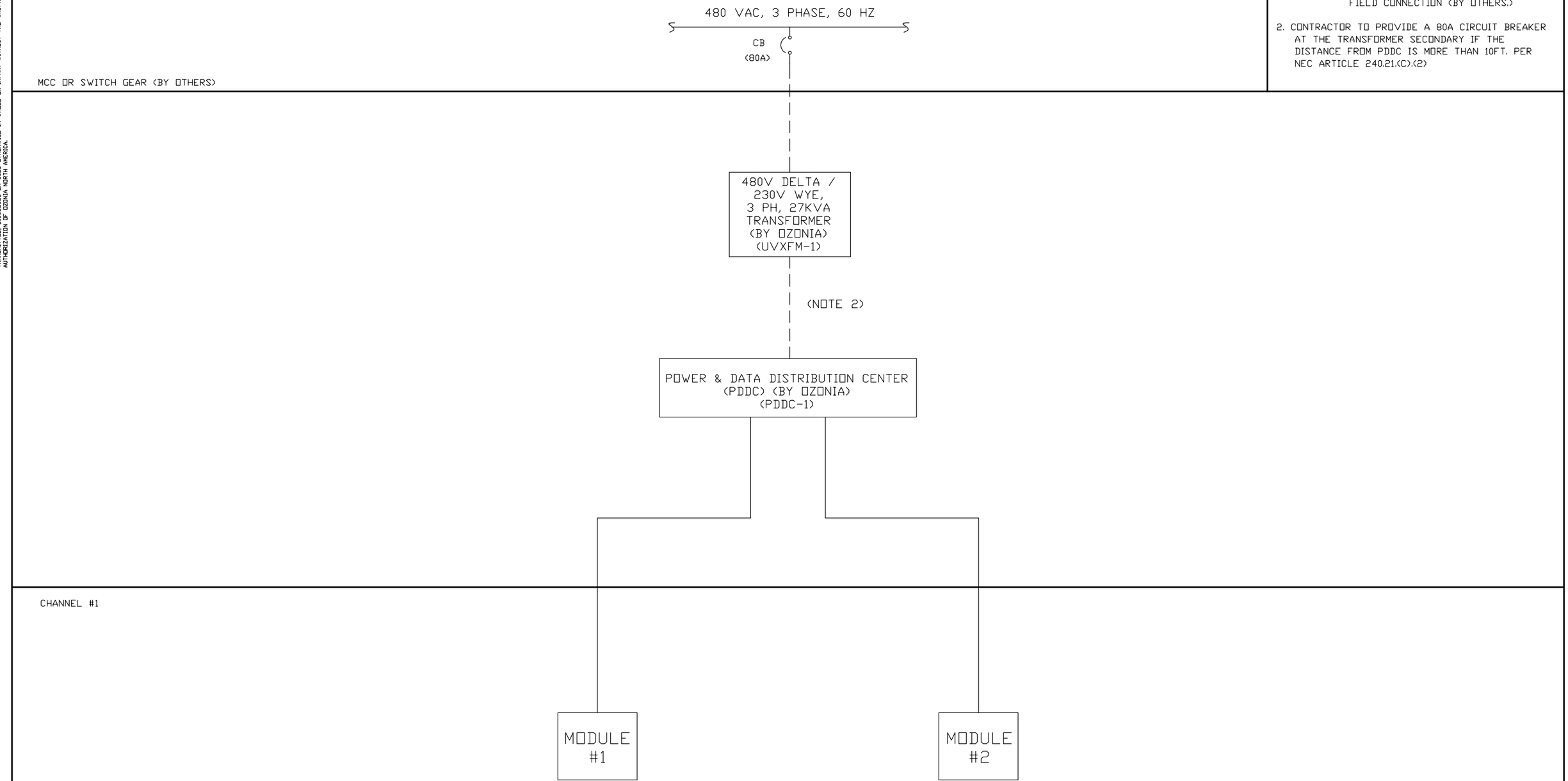
NOTE

1. LEGEND

—— —— ——: WIRING (BY OTHERS)

——————: CABLE ARE PROVIDED (BY OZONIA)
FIELD CONNECTION (BY OTHERS.)

2. CONTRACTOR TO PROVIDE A 80A CIRCUIT BREAKER AT THE TRANSFORMER SECONDARY IF THE DISTANCE FROM PDDC IS MORE THAN 10FT. PER NEC ARTICLE 240.21.(C).(2)



					SCALE: NONE	TITLE: SINGLE LINE DIAGRAM POWER DISTRIBUTION FOUNTAIN, CO	OZONIA NORTH AMERICA 600 WILLOW TREE ROAD LEONIA, NEW JERSEY 07605	SHT.: 1 NEXT END
					DRAWN: 11/04/11 EDN			
A	REVISED PER ENGINEER'S COMMENTS DATED 03/12/12	HD	PG	04/10/12	CHECKED: 11/04/11 PG		SIZE: B DWG. NO.: 18253-02-0225	REV.: A
REV.	DESCRIPTION	DRAWN	APPD.	DATE	APPROVED:			

Date: Apr 11, 2012 – 9:25am User: devineh File: C:\Degremont Vault\ONA\Contracts\18,000's\2011\31811253 Fountain,CO – Harold D. Thompson WRF\Drawings\0202\18253-02-0225.dwg

ITEM	QTY	TEXT	LETTER HEIGHT	NAMEPLATE DIMENSION	SPEC
1NP	1	POWER & DATA DISTRIBUTION CENTER PDDC-1	1/2"	3" x 5"	7
2NP	1	LOAD CENTER # 1	1/8"	3/4" x 2"	7

Specifications:

1 = Self-adhesive and screw holes white lamicoid: engraved black lettering
2 = Aluminum metal-photo: black lettering
3 = Self-adhesive red metal-photo: white lettering
4 = Self-adhesive and screw holes yellow lamicoid: engraved black lettering
5 = Self-adhesive and screw holes red lamicoid: engraved white lettering
6 = Self-adhesive and screw holes black lamicoid: engraved white lettering
7 = Self-adhesive black lamicoid: engraved white lettering:
8 = Self-adhesive red lamicoid: engraved white lettering

CHECKED:	TITLE:			SHT:
PG 11/14/11	Power & Data Distribution Center List of Nameplates Fountain, CO			1 of 1
APPROVED: PG 11/14/11	***OZONIA NORTH AMERICA*** 491 EDWARD H. ROSS DRIVE ELMWOOD PARK, NJ 07407	A	DWG No. 18253-02-0238	REV: A

Channel # 1

DCA/LCA	Name		0	1	2	3	4	5	6
	Channel 1 Actual Dose	F12: 10							
	Channel 1 UV int Value	N10: 52							
	Channel 1 Dose State	N10: 57	0=Not Present	1= mw/cm2	2= mw/cm2				
	Module 1 UV int State	N10: 130		1=SWW1 not present	2=SWW1 present	3= Old Type not present	4= Old type present		
	UVT % (if present)	N10: 186							
	Cleaning Period	N10: 221							
	Cleaning Period Hours Remaining	N10: 222							
	Cleaning Spacing	N10: 223							
	Cleaning Period Actual Minutes	N10: 224							
	Channel 1 Manual	N10: 4/0							
	Channel 1 Off	N10: 4/1							
	Channel 1 in Service	N10: 4/2							
	Adjacent Lamp Failure	N10: 10/11							
	Flow meter 1 Fault	N10: 15/0							
	Channel 1 Commlink Failure	N10: 15/10							
	Channel 1 DCA Commlink Failure	N10: 16/0							
	Channel 1 UV intensity Fault	N10: 16/10							
	Channel 1 Dose Failure Alarm	N10: 17/0							
	Channel# 1 Lamps OUT	N20: 231							
	Channel# 1 ROWS ON	N20: 232							
	Channel# 1 MODULE POLLING	N20: 233							
	Channel# 1 Status	N20: 234							
1	Adjacent Lamp Failure	N21: 0/5							
1	DCA 1 UV Intensity %	N21: 2							
1	DCA 1 Status	N21: 3	0=Off	1=Timing Out	2=On & OK	3=Problem	4=Fault		
1	DCA 1 SN (First 2 Chars)	N21: 4							
1	DCA 1 SN (Mid 2 Chars)	N21: 5							
1	DCA 1 SN (Last 2 Chars)	N21: 6							
1	DCA 1 Cleaner State	N21: 7	0=IN MOTION	1=TOP	2=BOTTOM	3=Moving UP	4=Moving down	5=Fault	
1	DCA 1 LTHT Value	N21: 8							
1	DCA 1 HOA State	N21: 9	0=AUTO	1=Manual	2=OFF				
1/1	LCA Alarm	N21: 10							
1/1	Temperature Deg C	N21: 11							
1/1	Lamp 1 Status	N21: 12	0=Off	1=ON & OK	2=Fault	3=Timing Out			
1/1	Lamp 1 Cycles Upper 10K	N21: 13							
1/1	Lamp 1 Cycles Lower 9,999	N21: 14							
1/1	Lamp 1 Hours	N21: 15							
1/1	Lamp 1 Milliamps	N21: 16							
1/1	Lamp 2 Status	N21: 17	0=Off	1=ON & OK	2=Fault	3=Timing Out			
1/1	Lamp 2 Cycles Upper 10K	N21: 18							
1/1	Lamp 2 Cycles Lower 9,999	N21: 19							
1/1	Lamp 2 Hours	N21: 20							
1/1	Lamp 2 Milliamps	N21: 21							
1/1	Lamp 3 Status	N21: 22	0=Off	1=ON & OK	2=Fault	3=Timing Out			
1/1	Lamp 3 Cycles Upper 10K	N21: 23							
1/1	Lamp 3 Cycles Lower 9,999	N21: 24							

1/1	Lamp 3 Hours	N21: 25				
1/1	Lamp 3 Milliamps	N21: 26				
1/1	Lamp 4 Status	N21: 27	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/1	Lamp 4 Cycles Upper 10K	N21: 28				
1/1	Lamp 4 Cycles Lower 9,999	N21: 29				
1/1	Lamp 4 Hours	N21: 30				
1/1	Lamp 4 Milliamps	N21: 31				
1/1	Lamp 5 Status	N21: 32	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/1	Lamp 5 Cycles Upper 10K	N21: 33				
1/1	Lamp 5 Cycles Lower 9,999	N21: 34				
1/1	Lamp 5 Hours	N21: 35				
1/1	Lamp 5 Milliamps	N21: 36				
1/1	Lamp 6 Status	N21: 37	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/1	Lamp 6 Cycles Upper 10K	N21: 38				
1/1	Lamp 6 Cycles Lower 9,999	N21: 39				
1/1	Lamp 6 Hours	N21: 40				
1/1	Lamp 6 Milliamps	N21: 41				
1/1	Lamp 7 Status	N21: 42	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/1	Lamp 7 Cycles Upper 10K	N21: 43				
1/1	Lamp 7 Cycles Lower 9,999	N21: 44				
1/1	Lamp 7 Hours	N21: 45				
1/1	Lamp 7 Milliamps	N21: 46				
1/1	Lamp 8 Status	N21: 47	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/1	Lamp 8 Cycles Upper 10K	N21: 48				
1/1	Lamp 8 Cycles Lower 9,999	N21: 49				
1/1	Lamp 8 Hours	N21: 50				
1/1	Lamp 8 Milliamps	N21: 51				
1/2	LCA Alarm	N21: 52				
1/2	Temperature Deg C	N21: 53				
1/2	Lamp 1 Status	N21: 54	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/2	Lamp 1 Cycles Upper 10K	N21: 55				
1/2	Lamp 1 Cycles Lower 9,999	N21: 56				
1/2	Lamp 1 Hours	N21: 57				
1/2	Lamp 1 Milliamps	N21: 58				
1/2	Lamp 2 Status	N21: 59	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/2	Lamp 2 Cycles Upper 10K	N21: 60				
1/2	Lamp 2 Cycles Lower 9,999	N21: 61				
1/2	Lamp 2 Hours	N21: 62				
1/2	Lamp 2 Milliamps	N21: 63				
1/2	Lamp 3 Status	N21: 64	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/2	Lamp 3 Cycles Upper 10K	N21: 65				
1/2	Lamp 3 Cycles Lower 9,999	N21: 66				
1/2	Lamp 3 Hours	N21: 67				
1/2	Lamp 3 Milliamps	N21: 68				
1/2	Lamp 4 Status	N21: 69	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/2	Lamp 4 Cycles Upper 10K	N21: 70				
1/2	Lamp 4 Cycles Lower 9,999	N21: 71				
1/2	Lamp 4 Hours	N21: 72				
1/2	Lamp 4 Milliamps	N21: 73				
1/2	Lamp 5 Status	N21: 74	0=Off	1=ON & OK	2=Fault	3=Timing Out

1/2	Lamp 5 Cycles Upper 10K	N21: 75				
1/2	Lamp 5 Cycles Lower 9,999	N21: 76				
1/2	Lamp 5 Hours	N21: 77				
1/2	Lamp 5 Milliamps	N21: 78				
1/2	Lamp 6 Status	N21: 79	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/2	Lamp 6 Cycles Upper 10K	N21: 80				
1/2	Lamp 6 Cycles Lower 9,999	N21: 81				
1/2	Lamp 6 Hours	N21: 82				
1/2	Lamp 6 Milliamps	N21: 83				
1/2	Lamp 7 Status	N21: 84	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/2	Lamp 7 Cycles Upper 10K	N21: 85				
1/2	Lamp 7 Cycles Lower 9,999	N21: 86				
1/2	Lamp 7 Hours	N21: 87				
1/2	Lamp 7 Milliamps	N21: 88				
1/2	Lamp 8 Status	N21: 89	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/2	Lamp 8 Cycles Upper 10K	N21: 90				
1/2	Lamp 8 Cycles Lower 9,999	N21: 91				
1/2	Lamp 8 Hours	N21: 92				
1/2	Lamp 8 Milliamps	N21: 93				
1/3	LCA Alarm	N21: 94				
1/3	Temperature Deg C	N21: 95				
1/3	Lamp 1 Status	N21: 96	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/3	Lamp 1 Cycles Upper 10K	N21: 97				
1/3	Lamp 1 Cycles Lower 9,999	N21: 98				
1/3	Lamp 1 Hours	N21: 99				
1/3	Lamp 1 Milliamps	N21: 100				
1/3	Lamp 2 Status	N21: 101	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/3	Lamp 2 Cycles Upper 10K	N21: 102				
1/3	Lamp 2 Cycles Lower 9,999	N21: 103				
1/3	Lamp 2 Hours	N21: 104				
1/3	Lamp 2 Milliamps	N21: 105				
1/3	Lamp 3 Status	N21: 106	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/3	Lamp 3 Cycles Upper 10K	N21: 107				
1/3	Lamp 3 Cycles Lower 9,999	N21: 108				
1/3	Lamp 3 Hours	N21: 109				
1/3	Lamp 3 Milliamps	N21: 110				
1/3	Lamp 4 Status	N21: 111	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/3	Lamp 4 Cycles Upper 10K	N21: 112				
1/3	Lamp 4 Cycles Lower 9,999	N21: 113				
1/3	Lamp 4 Hours	N21: 114				
1/3	Lamp 4 Milliamps	N21: 115				
1/3	Lamp 5 Status	N21: 116	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/3	Lamp 5 Cycles Upper 10K	N21: 117				
1/3	Lamp 5 Cycles Lower 9,999	N21: 118				
1/3	Lamp 5 Hours	N21: 119				
1/3	Lamp 5 Milliamps	N21: 120				
1/3	Lamp 6 Status	N21: 121	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/3	Lamp 6 Cycles Upper 10K	N21: 122				
1/3	Lamp 6 Cycles Lower 9,999	N21: 123				
1/3	Lamp 6 Hours	N21: 124				

1/3	Lamp 6 Milliamps	N21: 125				
1/3	Lamp 7 Status	N21: 126	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/3	Lamp 7 Cycles Upper 10K	N21: 127				
1/3	Lamp 7 Cycles Lower 9,999	N21: 128				
1/3	Lamp 7 Hours	N21: 129				
1/3	Lamp 7 Milliamps	N21: 130				
1/3	Lamp 8 Status	N21: 131	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/3	Lamp 8 Cycles Upper 10K	N21: 132				
1/3	Lamp 8 Cycles Lower 9,999	N21: 133				
1/3	Lamp 8 Hours	N21: 134				
1/3	Lamp 8 Milliamps	N21: 135				
1/4	LCA Alarm	N21: 136				
1/4	Temperature Deg C	N21: 137				
1/4	Lamp 1 Status	N21: 138	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/4	Lamp 1 Cycles Upper 10K	N21: 139				
1/4	Lamp 1 Cycles Lower 9,999	N21: 140				
1/4	Lamp 1 Hours	N21: 141				
1/4	Lamp 1 Milliamps	N21: 142				
1/4	Lamp 2 Status	N21: 143	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/4	Lamp 2 Cycles Upper 10K	N21: 144				
1/4	Lamp 2 Cycles Lower 9,999	N21: 145				
1/4	Lamp 2 Hours	N21: 146				
1/4	Lamp 2 Milliamps	N21: 147				
1/4	Lamp 3 Status	N21: 148	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/4	Lamp 3 Cycles Upper 10K	N21: 149				
1/4	Lamp 3 Cycles Lower 9,999	N21: 150				
1/4	Lamp 3 Hours	N21: 151				
1/4	Lamp 3 Milliamps	N21: 152				
1/4	Lamp 4 Status	N21: 153	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/4	Lamp 4 Cycles Upper 10K	N21: 154				
1/4	Lamp 4 Cycles Lower 9,999	N21: 155				
1/4	Lamp 4 Hours	N21: 156				
1/4	Lamp 4 Milliamps	N21: 157				
1/4	Lamp 5 Status	N21: 158	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/4	Lamp 5 Cycles Upper 10K	N21: 159				
1/4	Lamp 5 Cycles Lower 9,999	N21: 160				
1/4	Lamp 5 Hours	N21: 161				
1/4	Lamp 5 Milliamps	N21: 162				
1/4	Lamp 6 Status	N21: 163	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/4	Lamp 6 Cycles Upper 10K	N21: 164				
1/4	Lamp 6 Cycles Lower 9,999	N21: 165				
1/4	Lamp 6 Hours	N21: 166				
1/4	Lamp 6 Milliamps	N21: 167				
1/4	Lamp 7 Status	N21: 168	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/4	Lamp 7 Cycles Upper 10K	N21: 169				
1/4	Lamp 7 Cycles Lower 9,999	N21: 170				
1/4	Lamp 7 Hours	N21: 171				
1/4	Lamp 7 Milliamps	N21: 172				
1/4	Lamp 8 Status	N21: 173	0=Off	1=ON & OK	2=Fault	3=Timing Out
1/4	Lamp 8 Cycles Upper 10K	N21: 174				

1/4	Lamp 8 Cycles Lower 9,999	N21: 175					
1/4	Lamp 8 Hours	N21: 176					
1/4	Lamp 8 Milliamps	N21: 177					
1/5	LCA Alarm	N21: 178					
1/5	Temperature Deg C	N21: 179					
1/5	Lamp 1 Status	N21: 180	0=Off	1=ON & OK	2=Fault	3=Timing Out	
1/5	Lamp 1 Cycles Upper 10K	N21: 181					
1/5	Lamp 1 Cycles Lower 9,999	N21: 182					
1/5	Lamp 1 Hours	N21: 183					
1/5	Lamp 1 Milliamps	N21: 184					
1/5	Lamp 2 Status	N21: 185	0=Off	1=ON & OK	2=Fault	3=Timing Out	
1/5	Lamp 2 Cycles Upper 10K	N21: 186					
1/5	Lamp 2 Cycles Lower 9,999	N21: 187					
1/5	Lamp 2 Hours	N21: 188					
1/5	Lamp 2 Milliamps	N21: 189					
1/5	Lamp 3 Status	N21: 190	0=Off	1=ON & OK	2=Fault	3=Timing Out	
1/5	Lamp 3 Cycles Upper 10K	N21: 191					
1/5	Lamp 3 Cycles Lower 9,999	N21: 192					
1/5	Lamp 3 Hours	N21: 193					
1/5	Lamp 3 Milliamps	N21: 194					
1/5	Lamp 4 Status	N21: 195	0=Off	1=ON & OK	2=Fault	3=Timing Out	
1/5	Lamp 4 Cycles Upper 10K	N21: 196					
1/5	Lamp 4 Cycles Lower 9,999	N21: 197					
1/5	Lamp 4 Hours	N21: 198					
1/5	Lamp 4 Milliamps	N21: 199					
1/5	Lamp 5 Status	N21: 200	0=Off	1=ON & OK	2=Fault	3=Timing Out	
1/5	Lamp 5 Cycles Upper 10K	N21: 201					
1/5	Lamp 5 Cycles Lower 9,999	N21: 202					
1/5	Lamp 5 Hours	N21: 203					
1/5	Lamp 5 Milliamps	N21: 204					
1/5	Lamp 6 Status	N21: 205	0=Off	1=ON & OK	2=Fault	3=Timing Out	
1/5	Lamp 6 Cycles Upper 10K	N21: 206					
1/5	Lamp 6 Cycles Lower 9,999	N21: 207					
1/5	Lamp 6 Hours	N21: 208					
1/5	Lamp 6 Milliamps	N21: 209					
1/5	Lamp 7 Status	N21: 210	0=Off	1=ON & OK	2=Fault	3=Timing Out	
1/5	Lamp 7 Cycles Upper 10K	N21: 211					
1/5	Lamp 7 Cycles Lower 9,999	N21: 212					
1/5	Lamp 7 Hours	N21: 213					
1/5	Lamp 7 Milliamps	N21: 214					
1/5	Lamp 8 Status	N21: 215	0=Off	1=ON & OK	2=Fault	3=Timing Out	
1/5	Lamp 8 Cycles Upper 10K	N21: 216					
1/5	Lamp 8 Cycles Lower 9,999	N21: 217					
1/5	Lamp 8 Hours	N21: 218					
1/5	Lamp 8 Amps	N21: 219					
2	Adjacent Lamp Failure	N22: 0/5					
2	DCA 2 UV Intensity %	N22: 2					
2	DCA 2 Status	N22: 3	0=Off	1=Timing Out	2=On & OK	3=Problem	4=Fault
2	DCA 2 SN (First 2 Chars)	N22: 4					

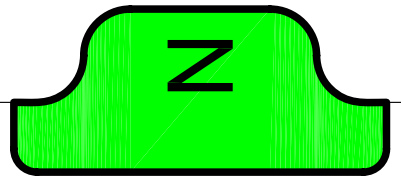
2	DCA 2 SN (Mid 2 Chars)	N22: 5						
2	DCA 2 SN (Last 2 Chars)	N22: 6						
2	DCA 2 Cleaner State	N22: 7	0=IN MOTION	1=TOP	2=BOTTOM	3=Moving UP	4=Moving down	5=Fault
2	DCA 2 LTHT Value	N22: 8						
2	DCA 3 HOA State	N22: 9	0=AUTO	1=Manual	2=OFF			
2/1	LCA Alarm	N22: 10						
2/1	Temperature Deg C	N22: 11						
2/1	Lamp 1 Status	N22: 12	0=Off	1=ON & OK	2=Fault	3=Timing Out		
2/1	Lamp 1 Cycles Upper 10K	N22: 13						
2/1	Lamp 1 Cycles Lower 9,999	N22: 14						
2/1	Lamp 1 Hours	N22: 15						
2/1	Lamp 1 Milliamps	N22: 16						
2/1	Lamp 2 Status	N22: 17	0=Off	1=ON & OK	2=Fault	3=Timing Out		
2/1	Lamp 2 Cycles Upper 10K	N22: 18						
2/1	Lamp 2 Cycles Lower 9,999	N22: 19						
2/1	Lamp 2 Hours	N22: 20						
2/1	Lamp 2 Milliamps	N22: 21						
2/1	Lamp 3 Status	N22: 22	0=Off	1=ON & OK	2=Fault	3=Timing Out		
2/1	Lamp 3 Cycles Upper 10K	N22: 23						
2/1	Lamp 3 Cycles Lower 9,999	N22: 24						
2/1	Lamp 3 Hours	N22: 25						
2/1	Lamp 3 Milliamps	N22: 26						
2/1	Lamp 4 Status	N22: 27	0=Off	1=ON & OK	2=Fault	3=Timing Out		
2/1	Lamp 4 Cycles Upper 10K	N22: 28						
2/1	Lamp 4 Cycles Lower 9,999	N22: 29						
2/1	Lamp 4 Hours	N22: 30						
2/1	Lamp 4 Milliamps	N22: 31						
2/1	Lamp 5 Status	N22: 32	0=Off	1=ON & OK	2=Fault	3=Timing Out		
2/1	Lamp 5 Cycles Upper 10K	N22: 33						
2/1	Lamp 5 Cycles Lower 9,999	N22: 34						
2/1	Lamp 5 Hours	N22: 35						
2/1	Lamp 5 Milliamps	N22: 36						
2/1	Lamp 6 Status	N22: 37	0=Off	1=ON & OK	2=Fault	3=Timing Out		
2/1	Lamp 6 Cycles Upper 10K	N22: 38						
2/1	Lamp 6 Cycles Lower 9,999	N22: 39						
2/1	Lamp 6 Hours	N22: 40						
2/1	Lamp 6 Milliamps	N22: 41						
2/1	Lamp 7 Status	N22: 42	0=Off	1=ON & OK	2=Fault	3=Timing Out		
2/1	Lamp 7 Cycles Upper 10K	N22: 43						
2/1	Lamp 7 Cycles Lower 9,999	N22: 44						
2/1	Lamp 7 Hours	N22: 45						
2/1	Lamp 7 Milliamps	N22: 46						
2/1	Lamp 8 Status	N22: 47	0=Off	1=ON & OK	2=Fault	3=Timing Out		
2/1	Lamp 8 Cycles Upper 10K	N22: 48						
2/1	Lamp 8 Cycles Lower 9,999	N22: 49						
2/1	Lamp 8 Hours	N22: 50						
2/1	Lamp 8 Milliamps	N22: 51						
2/2	LCA Alarm	N22: 52						
2/2	Temperature Deg C	N22: 53						
2/2	Lamp 1 Status	N22: 54	0=Off	1=ON & OK	2=Fault	3=Timing Out		

2/2	Lamp 1 Cycles Upper 10K	N22: 55				
2/2	Lamp 1 Cycles Lower 9,999	N22: 56				
2/2	Lamp 1 Hours	N22: 57				
2/2	Lamp 1 Milliamps	N22: 58				
2/2	Lamp 2 Status	N22: 59	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/2	Lamp 2 Cycles Upper 10K	N22: 60				
2/2	Lamp 2 Cycles Lower 9,999	N22: 61				
2/2	Lamp 2 Hours	N22: 62				
2/2	Lamp 2 Milliamps	N22: 63				
2/2	Lamp 3 Status	N22: 64	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/2	Lamp 3 Cycles Upper 10K	N22: 65				
2/2	Lamp 3 Cycles Lower 9,999	N22: 66				
2/2	Lamp 3 Hours	N22: 67				
2/2	Lamp 3 Milliamps	N22: 68				
2/2	Lamp 4 Status	N22: 69	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/2	Lamp 4 Cycles Upper 10K	N22: 70				
2/2	Lamp 4 Cycles Lower 9,999	N22: 71				
2/2	Lamp 4 Hours	N22: 72				
2/2	Lamp 4 Milliamps	N22: 73				
2/2	Lamp 5 Status	N22: 74	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/2	Lamp 5 Cycles Upper 10K	N22: 75				
2/2	Lamp 5 Cycles Lower 9,999	N22: 76				
2/2	Lamp 5 Hours	N22: 77				
2/2	Lamp 5 Milliamps	N22: 78				
2/2	Lamp 6 Status	N22: 79	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/2	Lamp 6 Cycles Upper 10K	N22: 80				
2/2	Lamp 6 Cycles Lower 9,999	N22: 81				
2/2	Lamp 6 Hours	N22: 82				
2/2	Lamp 6 Milliamps	N22: 83				
2/2	Lamp 7 Status	N22: 84	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/2	Lamp 7 Cycles Upper 10K	N22: 85				
2/2	Lamp 7 Cycles Lower 9,999	N22: 86				
2/2	Lamp 7 Hours	N22: 87				
2/2	Lamp 7 Milliamps	N22: 88				
2/2	Lamp 8 Status	N22: 89	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/2	Lamp 8 Cycles Upper 10K	N22: 90				
2/2	Lamp 8 Cycles Lower 9,999	N22: 91				
2/2	Lamp 8 Hours	N22: 92				
2/2	Lamp 8 Milliamps	N22: 93				
2/3	LCA Alarm	N22: 94				
2/3	Temperature Deg C	N22: 95				
2/3	Lamp 1 Status	N22: 96	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/3	Lamp 1 Cycles Upper 10K	N22: 97				
2/3	Lamp 1 Cycles Lower 9,999	N22: 98				
2/3	Lamp 1 Hours	N22: 99				
2/3	Lamp 1 Milliamps	N22: 100				
2/3	Lamp 2 Status	N22: 101	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/3	Lamp 2 Cycles Upper 10K	N22: 102				
2/3	Lamp 2 Cycles Lower 9,999	N22: 103				
2/3	Lamp 2 Hours	N22: 104				

2/3	Lamp 2 Milliamps	N22: 105				
2/3	Lamp 3 Status	N22: 106	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/3	Lamp 3 Cycles Upper 10K	N22: 107				
2/3	Lamp 3 Cycles Lower 9,999	N22: 108				
2/3	Lamp 3 Hours	N22: 109				
2/3	Lamp 3 Milliamps	N22: 110				
2/3	Lamp 4 Status	N22: 111	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/3	Lamp 4 Cycles Upper 10K	N22: 112				
2/3	Lamp 4 Cycles Lower 9,999	N22: 113				
2/3	Lamp 4 Hours	N22: 114				
2/3	Lamp 4 Milliamps	N22: 115				
2/3	Lamp 5 Status	N22: 116	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/3	Lamp 5 Cycles Upper 10K	N22: 117				
2/3	Lamp 5 Cycles Lower 9,999	N22: 118				
2/3	Lamp 5 Hours	N22: 119				
2/3	Lamp 5 Milliamps	N22: 120				
2/3	Lamp 6 Status	N22: 121	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/3	Lamp 6 Cycles Upper 10K	N22: 122				
2/3	Lamp 6 Cycles Lower 9,999	N22: 123				
2/3	Lamp 6 Hours	N22: 124				
2/3	Lamp 6 Milliamps	N22: 125				
2/3	Lamp 7 Status	N22: 126	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/3	Lamp 7 Cycles Upper 10K	N22: 127				
2/3	Lamp 7 Cycles Lower 9,999	N22: 128				
2/3	Lamp 7 Hours	N22: 129				
2/3	Lamp 7 Milliamps	N22: 130				
2/3	Lamp 8 Status	N22: 131	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/3	Lamp 8 Cycles Upper 10K	N22: 132				
2/3	Lamp 8 Cycles Lower 9,999	N22: 133				
2/3	Lamp 8 Hours	N22: 134				
2/3	Lamp 8 Milliamps	N22: 135				
2/4	LCA Alarm	N22: 136				
2/4	Temperature Deg C	N22: 137				
2/4	Lamp 1 Status	N22: 138	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/4	Lamp 1 Cycles Upper 10K	N22: 139				
2/4	Lamp 1 Cycles Lower 9,999	N22: 140				
2/4	Lamp 1 Hours	N22: 141				
2/4	Lamp 1 Milliamps	N22: 142				
2/4	Lamp 2 Status	N22: 143	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/4	Lamp 2 Cycles Upper 10K	N22: 144				
2/4	Lamp 2 Cycles Lower 9,999	N22: 145				
2/4	Lamp 2 Hours	N22: 146				
2/4	Lamp 2 Milliamps	N22: 147				
2/4	Lamp 3 Status	N22: 148	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/4	Lamp 3 Cycles Upper 10K	N22: 149				
2/4	Lamp 3 Cycles Lower 9,999	N22: 150				
2/4	Lamp 3 Hours	N22: 151				
2/4	Lamp 3 Milliamps	N22: 152				
2/4	Lamp 4 Status	N22: 153	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/4	Lamp 4 Cycles Upper 10K	N22: 154				

2/4	Lamp 4 Cycles Lower 9,999	N22: 155				
2/4	Lamp 4 Hours	N22: 156				
2/4	Lamp 4 Milliamps	N22: 157				
2/4	Lamp 5 Status	N22: 158	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/4	Lamp 5 Cycles Upper 10K	N22: 159				
2/4	Lamp 5 Cycles Lower 9,999	N22: 160				
2/4	Lamp 5 Hours	N22: 161				
2/4	Lamp 5 Milliamps	N22: 162				
2/4	Lamp 6 Status	N22: 163	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/4	Lamp 6 Cycles Upper 10K	N22: 164				
2/4	Lamp 6 Cycles Lower 9,999	N22: 165				
2/4	Lamp 6 Hours	N22: 166				
2/4	Lamp 6 Milliamps	N22: 167				
2/4	Lamp 7 Status	N22: 168	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/4	Lamp 7 Cycles Upper 10K	N22: 169				
2/4	Lamp 7 Cycles Lower 9,999	N22: 170				
2/4	Lamp 7 Hours	N22: 171				
2/4	Lamp 7 Milliamps	N22: 172				
2/4	Lamp 8 Status	N22: 173	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/4	Lamp 8 Cycles Upper 10K	N22: 174				
2/4	Lamp 8 Cycles Lower 9,999	N22: 175				
2/4	Lamp 8 Hours	N22: 176				
2/4	Lamp 8 Milliamps	N22: 177				
2/5	LCA Alarm	N22: 178				
2/5	Temperature Deg C	N22: 179				
2/5	Lamp 1 Status	N22: 180	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/5	Lamp 1 Cycles Upper 10K	N22: 181				
2/5	Lamp 1 Cycles Lower 9,999	N22: 182				
2/5	Lamp 1 Hours	N22: 183				
2/5	Lamp 1 Milliamps	N22: 184				
2/5	Lamp 2 Status	N22: 185	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/5	Lamp 2 Cycles Upper 10K	N22: 186				
2/5	Lamp 2 Cycles Lower 9,999	N22: 187				
2/5	Lamp 2 Hours	N22: 188				
2/5	Lamp 2 Milliamps	N22: 189				
2/5	Lamp 3 Status	N22: 190	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/5	Lamp 3 Cycles Upper 10K	N22: 191				
2/5	Lamp 3 Cycles Lower 9,999	N22: 192				
2/5	Lamp 3 Hours	N22: 193				
2/5	Lamp 3 Milliamps	N22: 194				
2/5	Lamp 4 Status	N22: 195	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/5	Lamp 4 Cycles Upper 10K	N22: 196				
2/5	Lamp 4 Cycles Lower 9,999	N22: 197				
2/5	Lamp 4 Hours	N22: 198				
2/5	Lamp 4 Milliamps	N22: 199				
2/5	Lamp 5 Status	N22: 200	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/5	Lamp 5 Cycles Upper 10K	N22: 201				
2/5	Lamp 5 Cycles Lower 9,999	N22: 202				
2/5	Lamp 5 Hours	N22: 203				
2/5	Lamp 5 Milliamps	N22: 204				

2/5	Lamp 6 Status	N22: 205	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/5	Lamp 6 Cycles Upper 10K	N22: 206				
2/5	Lamp 6 Cycles Lower 9,999	N22: 207				
2/5	Lamp 6 Hours	N22: 208				
2/5	Lamp 6 Milliamps	N22: 209				
2/5	Lamp 7 Status	N22: 210	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/5	Lamp 7 Cycles Upper 10K	N22: 211				
2/5	Lamp 7 Cycles Lower 9,999	N22: 212				
2/5	Lamp 7 Hours	N22: 213				
2/5	Lamp 7 Milliamps	N22: 214				
2/5	Lamp 8 Status	N22: 215	0=Off	1=ON & OK	2=Fault	3=Timing Out
2/5	Lamp 8 Cycles Upper 10K	N22: 216				
2/5	Lamp 8 Cycles Lower 9,999	N22: 217				
2/5	Lamp 8 Hours	N22: 218				
2/5	Lamp 8 Amps	N22: 219				


Z

Item	P/N	Description	Quantity		
		Aquaray 40 HO Modules			
1	X0016-H09	UV LAMPS (WARM LAMP)	8		
2	X0015-H13	QUARTZ JACKET	8		
3	X0025-G03	WIPER BRUSH	40		
4	X0029-H01	ELECTRONIC BALLAST	1		
5	X0067-H01	PAIR OF UV GOGGLES	4		
6	X0053-H04	UV AREA WARNING SIGNS	3		
		Note: Spare parts shall be boxed or package for long-term			
		storage. Identify each item with manufacturer's name, description			
		and part number on the exterior of the package.			

OZONIA North America
600 Willow Tree Rd., Leonia NJ 07605

Sht. 1 of 1	**Rev. (0)**	**Issued: 11/11/11**	
SPARE PARTS LIST	Dwg.		
Fountain, CO	**A**	**18253-64-0100**	

Item	P/N	Description	Quantity	
		EYE SHIELD ASSEMBLY		
1	X0059-H03	EYESHIELD	3	
2	M0023-H01	DROP IN ANCHORS 1/2" 13 UNC, HILTI	15	
3	M0011-H02	HEX HEAD SCREW,1/2" 13 UNC x 1.5"	15	
4	M0014-H07	FLAT WASHER, 1/2" DIA.	15	
		CLEANING SYSTEM		
5	X0061-H01	SPREADER BAR (1 MODULE)	1	
6	X0046-H05	CLEANING SYSTEM MOTOR EXERCISER	1	
7	18253-11-0601	**WEIR LEVEL CONTROL**	1	

OZONIA North America
600 Willow Tree Rd, Leonia NJ 07605

Accessory & Special Equipment	**Sht. 1 of 1**	**Issued:**	**04/23/12**
	Dwg.	**Rev.**	**A**
Fountain, CO	**A**	**18253-11-0001**	

THIS PAGE IS INTENTIONALLY LEFT BLANK

ITEM#	QTY.	DESCRIPTION	MANUF/SUPPL	MODEL#	PART#	OZONIA#	SIZE	MATERIAL	FINISH
-	1	EYESHIELD PLAIN	-		-	X0059-H03	24 1/4 x 23 3/4	304 S.S.	

WHERE USED:

° AQUARAY 40 HO MODULE ASSEMBLY X0030-H01, X0030-H02, X0030-H05, X0030-H06

MANUFACTURER:

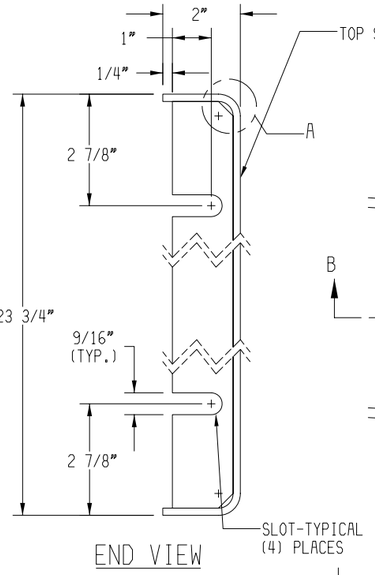
-

SUPPLIER ADDRESS:

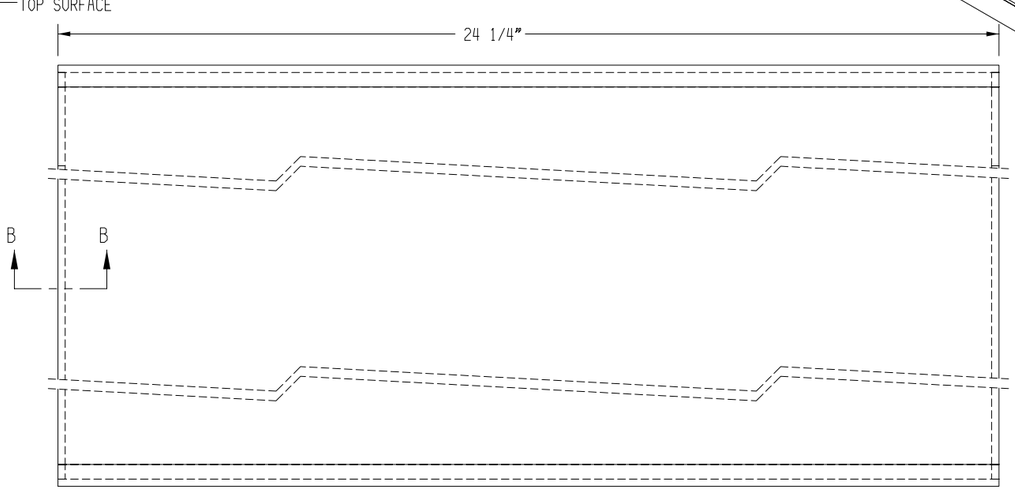
SPECIFICATION:

NOTES:

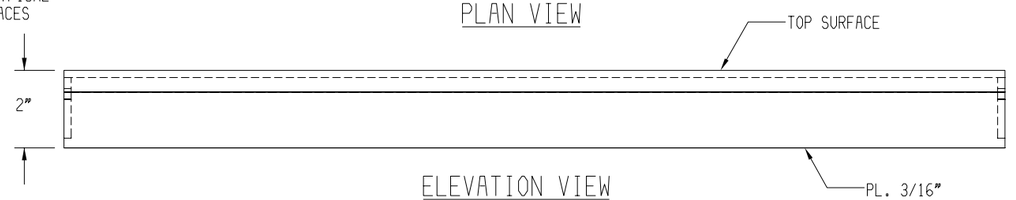
1. IDI REFERENCES:
   DWG. NO. 59919 REV. A.
2. NORMAL ±1/16" EXCEPT AS SHOWN. TOLERANCES APPLY PARTICULARLY TO OVER-ALL DIMENSIONS AND MUST NOT BE ACCUMULATIVE. HOLE LOCATION DIMENSIONS MUST BE HELD TO ±1/32".
3. ALL WELDS MUST BE CLEANED OF ALL WELD SPATTER AND HEAT DISCOLORATION.



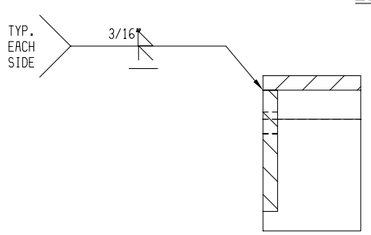
END VIEW



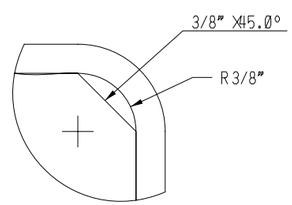
PLAN VIEW



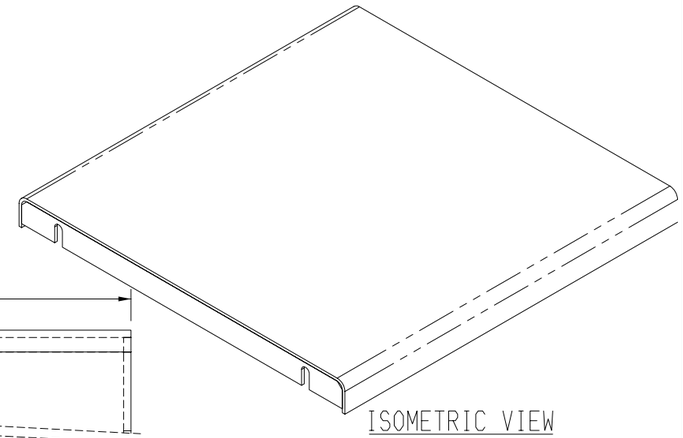
ELEVATION VIEW



SECTION B-B
SCALE 1 : 2



DETAIL A
SCALE 1 : 1



ISOMETRIC VIEW

REV.	DESCRIPTION	DRAWN	APPD.	DATE

SCALE: N.T.S.
DRAWN: 04/03/06 MDL
CHECKED: 04/03/06 WY
APPROVED:

TITLE: EYESHIELD PLAIN

OZONIA®
OZONIA NORTH AMERICA
Post Office Box 455
Elmwood Park, New Jersey 07407

SHT.: 1 OF 1
SIZE: B
DWG. NO.: 18000-11-0101
REV.: -

THIS PAGE IS INTENTIONALLY LEFT BLANK

ITEM#	QTY.	DESCRIPTION	MANUF/SUPPL	MODEL#	PART#	OZONIA#	SIZE	MATERIAL	FINISH
-	1	DROP-IN ANCHORS	HILTI CORP. OR EQUIVALENT			M0023-H01		S.S.	PLAIN

WHERE USED:

- EYESHIELD PLAIN X0059-H01~H18
- 29" EYESHIELD ASSEMBLY X0037-H01~H16
- EYESHIELD W/ NOTCH X0080-H0~H03

MANUFACTURER:

HILTI, INC.

PO BOX 21148

TULSA, OK 74121

PHONE: (800) 879-8000

FAX: (800) 879-7000

SUPPLIER ADDRESS:

McMASTER-CARR

473 RODGE ROAD P.O BOX 440

DAYTON, N.J. 08810-0317

TEL NO. 1-732-329-3200

FAX NO. 1-732-329-3772

OR

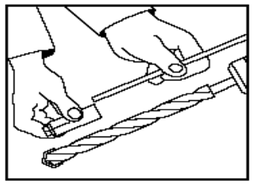
EQUIVALENT

SPECIFICATION:

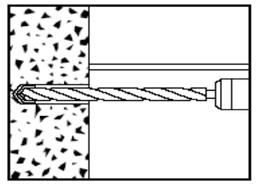
Anchoring Systems

HDI / HDI-L Drop-In Anchor **4.3.5**

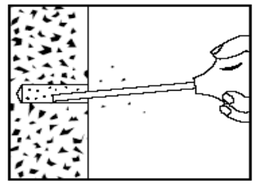
4.3.5.4 Installation Instructions



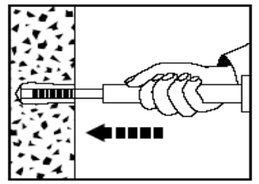
1. Adjust depth gauge so that anchor will be flush with the concrete surface when installed.



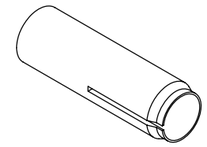
2. Hammer drill hole.



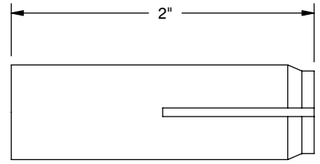
3. Clean hole.



4. Install anchor using proper setting tool. Setting tool to be driven into anchor until setting tool shoulder meets top of anchor.



ISOMETRIC VIEW



Anchor Threade size	Stainless Steel		Box Qty.
	Description	Item No.	
1/2"	HDI (SS 303) 1/2	336432	50

NOTES:

1. IDI REFERENCES:
   DWG. NO. - REV. -
2. UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.

Anchor Threade size	Hand Setting Tools		Automatic Setting Tools	
	Description	Item No.	Description	Item No.
1/2"	HST 1/2 Setting Tools	32980	HSD-MM 1/2" (TE-C-24SD12 1/2" SETTING	243752

M0023-H01

REV.	DESCRIPTION	DRAWN	APPD.	DATE
A	REVISED WHERE USED ITEM LIST	MDL	WY	06/05/06

SCALE: N.T.S.
DRAWN: 09/08/05 JArg
CHECKED: 09/08/05 WY
APPROVED:

TITLE: DROP-IN ANCHORS

0

OZONIA NORTH AMERICA
Post Office Box 455
Elmwood Park, New Jersey 07407

SHT.: 1 OF 1
SIZE: B
DWG. NO.: M0023
REV.: A

THIS PAGE IS INTENTIONALLY LEFT BLANK

ITEM#	QTY.	DESCRIPTION	MANUF/SUPPL	MODEL#	PART#	OZONIA#	SIZE	MATERIAL	FINISH
	1	SPREADER BAR ASSEMBLY				X0061-H05		304 S.S.	

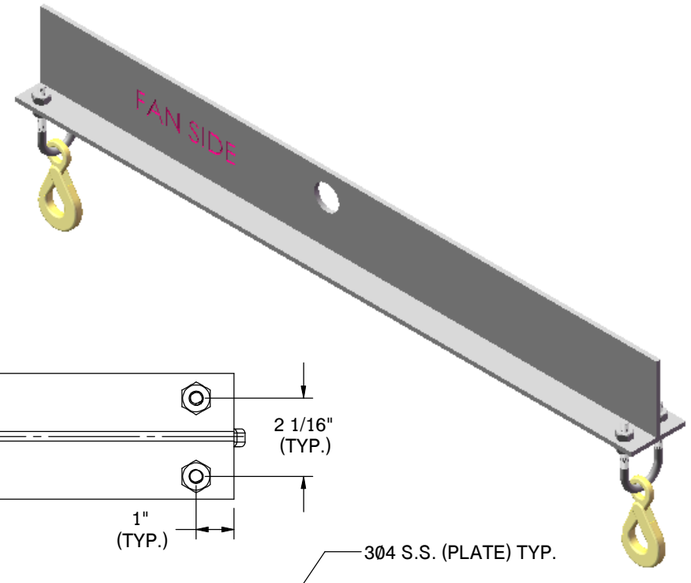
WHERE USED:

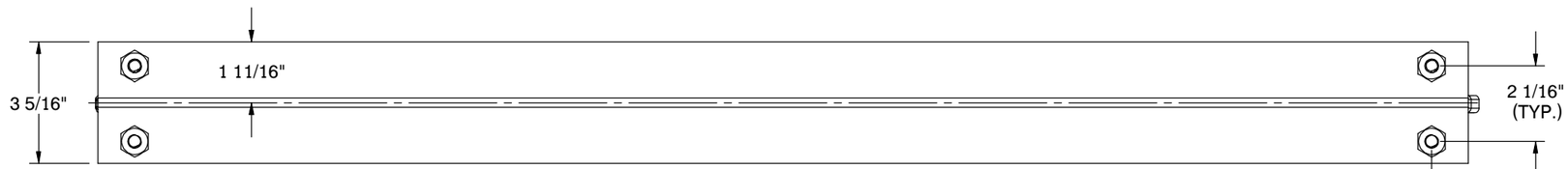
- AQUARAY 40 HO ASSEMBLY X0030-H20, X0030-H21

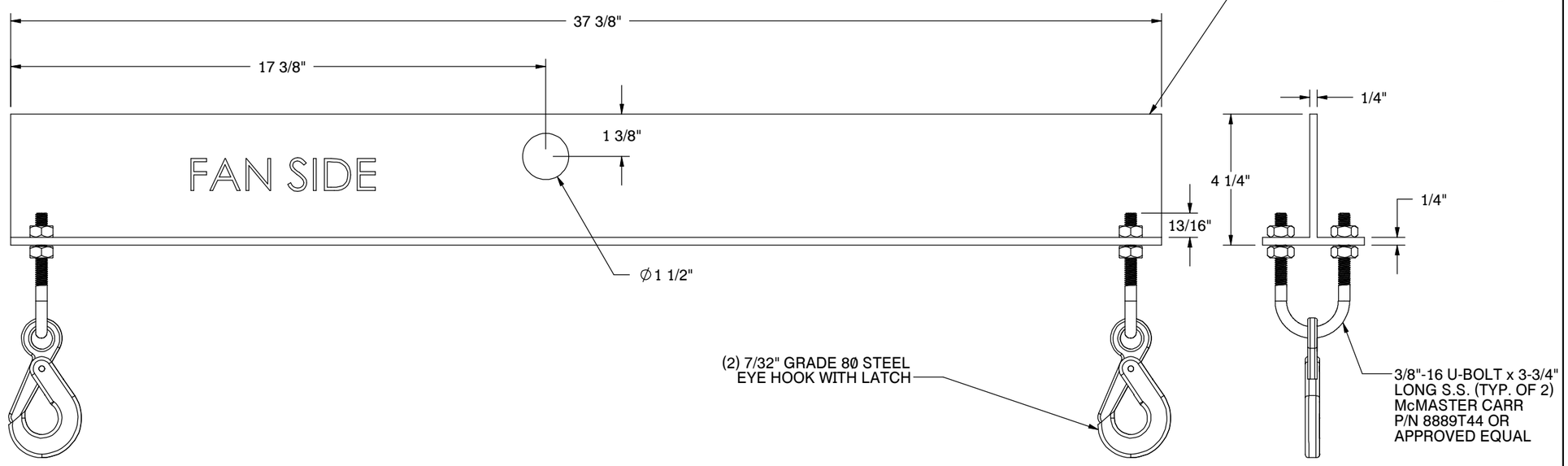
MANUFACTURER:

SUPPLIER ADDRESS:

SPECIFICATION:







NOTES:

1. UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
2. TOLERANCES: UNLESS OTHERWISE NOTED. NORMAL ±.0625 (1/16") EXCEPT AS SHOWN. APPLY PARTICULARLY TO OVER-ALL DIMENSION AND MUST NOT BE ACCUMULATIVE. HOLE LOCATION DIMENSIONS MUST BE HELD TO ±.0312" (1/32"). PERPENDICULARITY AND PARALLELISM SHALL NOT EXCEED .0625" (1/16") OR ANY POINT TO POINT MEASUREMENT HOLE DIAMETER ±.015" (1/64").
3. SPREADER BAR PROVIDED FULLY ASSEMBLED.
4. SPREADER BAR FOR USE WITH JIB CRANE HOIST. HOIST'S HOOK TO FIT THROUGH 1-1/2" DIA. HOLE. SPREADER BAR'S HOOK TO FIT THROUGH UV MODULES LIFTING EYE.

X0061-H05

REV.	DESCRIPTION	DRAWN	APPD.	DATE

SCALE: N.T.S
DRAWN: 08/25/11 MDL
CHECKED: 08/25/11 MDL
APPROVED:

TITLE: AQUARAY 40 HO SPREADER BAR ASSEMBLY

OZONIA NORTH AMERICA
Post Office Box 455
Elmwood Park, New Jersey 07407

SHT.: 1 OF 1
SIZE: B
DWG. NO.: X0061
REV.:

THIS PAGE IS INTENTIONALLY LEFT BLANK

ITEM#	QTY	DESCRIPTION	MANUF/SUPPL	MODEL#	PART#	OZONIA#	SIZE	MATERIAL	FINISH
-	1	MOTOR EXERCISER ASSEMBLY	DALLAS ELECTRIC		X0046-H05	-	-	-	

WHERE USED:

AQUARAY 40 HO MODULE ASSEMBLY X0030-H01, X0030-H02, X0030-H03, X0030-H04, X0030-H05, X0030-H06, X0030-H07, X0030-H08, X0030-H15

MANUFACTURER ADDRESS:

SUPPLIER ADDRESS:

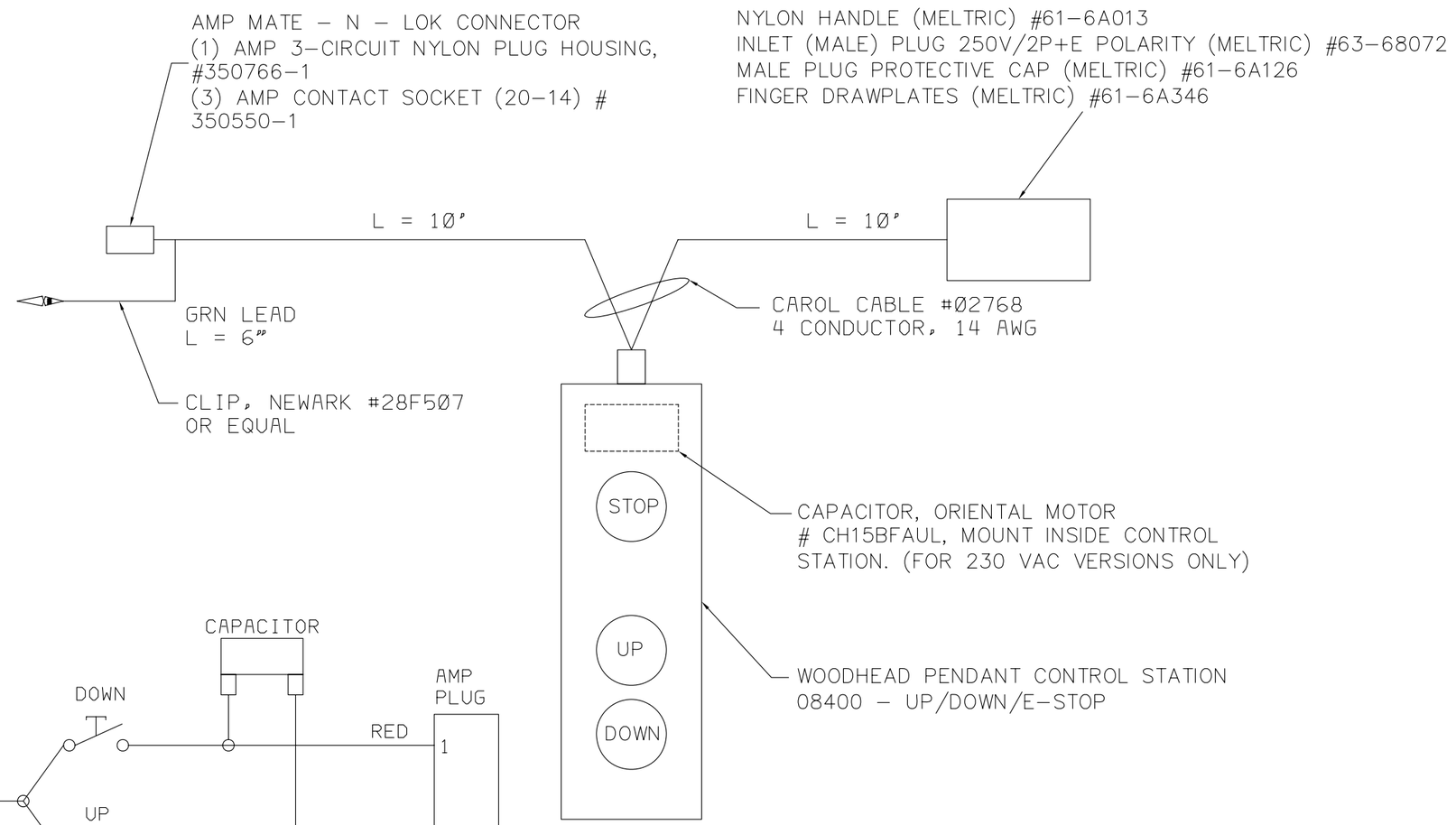
-

SPECIFICATION:

-

NOTES:

1. IDI REFERENCES:
2. UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES.



X0046-H05

REV.	DESCRIPTION	DRAWN	APPD.	DATE

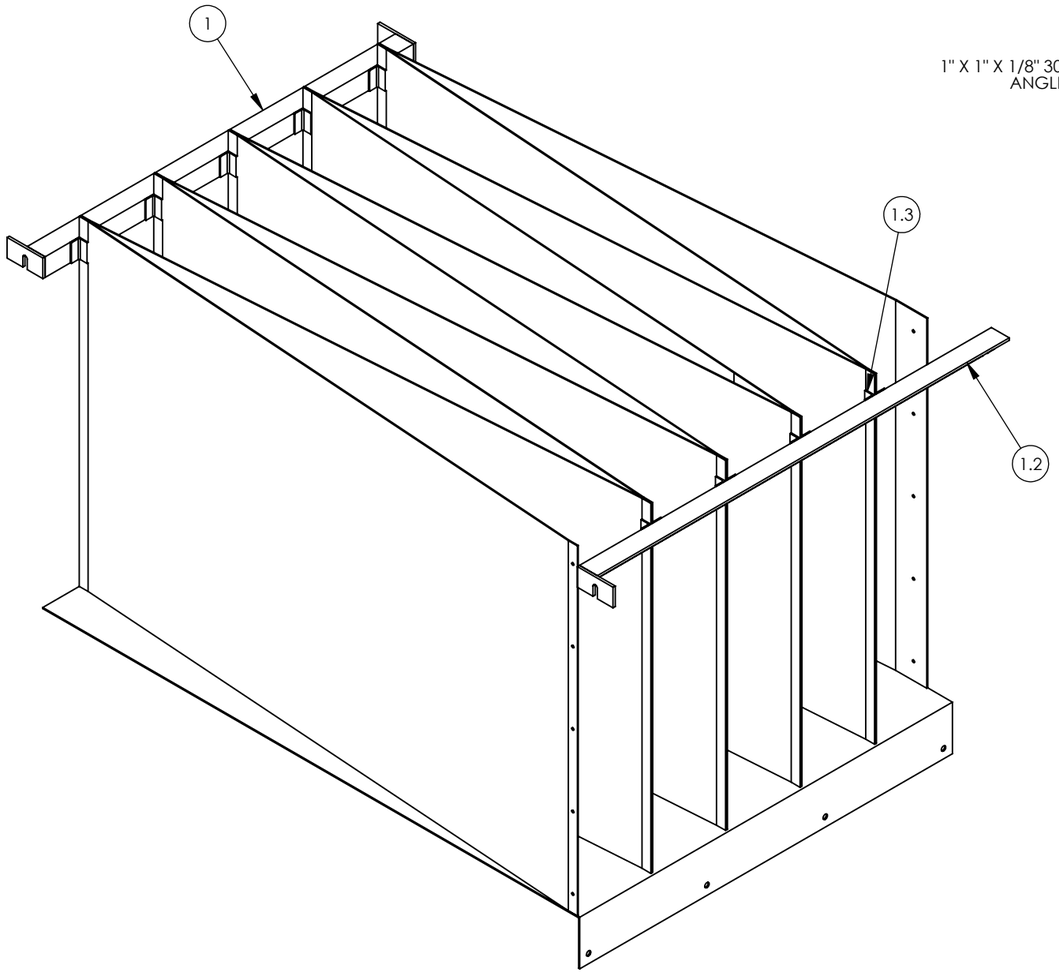
SCALE: NONE
DRAWN: 10/22/09 MDL
CHECKED: 10/22/09 HG
APPROVED:

TITLE: MOTOR EXERCISER ASSEMBLY

OZONIA® OZONIA NORTH AMERICA
Post Office Box 455
Elmwood Park, New Jersey 07407

SHT.: 1 OF 1
SIZE: B
DWG. NO.: X0046
REV.: –

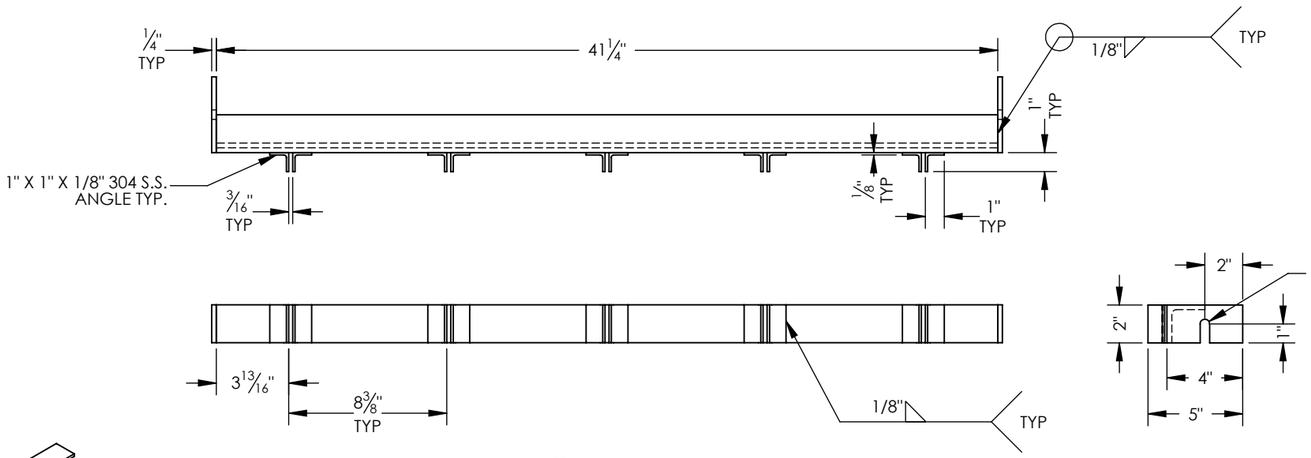
THIS PAGE IS INTENTIONALLY LEFT BLANK



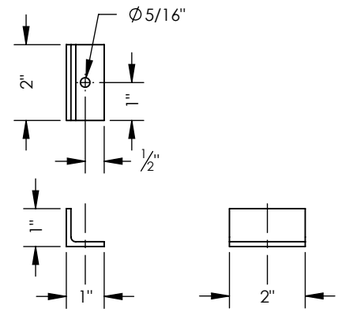
WEIR ASSEMBLY ISOMETRIC VIEW

NOTES:

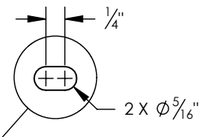
1. WEIR TROUGH TO BE MADE IN 304L S.S.
2. FIELD CAULKING REQ'D ON ALL SEAMS AFTER ASSEMBLY FOR WATERTIGHT CONSTRUCTION.



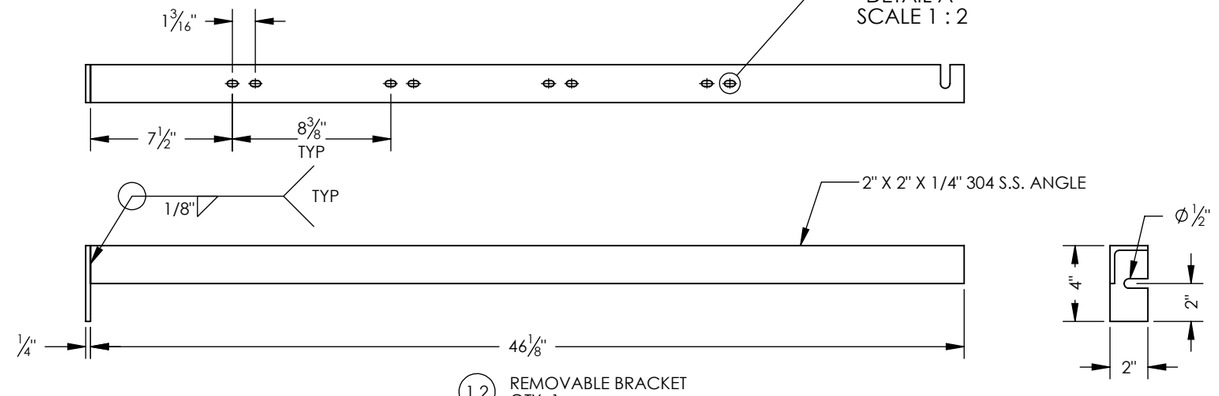
(1) FIXED BRACKET QTY. 1



(1.3) QTY. 8



DETAIL A
SCALE 1 : 2



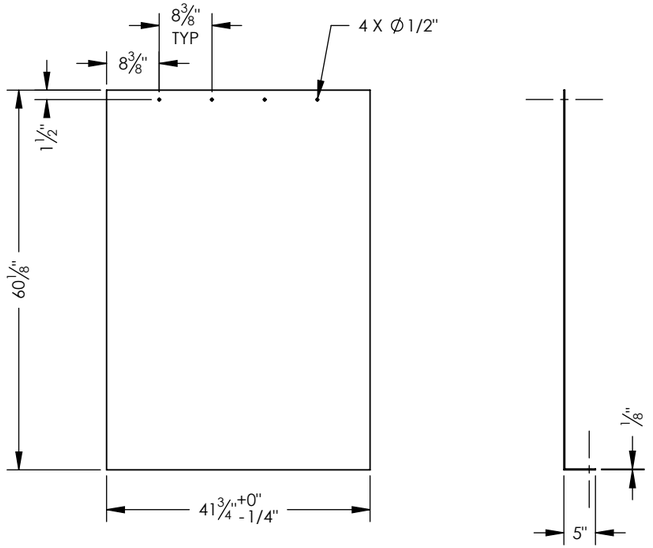
(1.2) REMOVABLE BRACKET QTY. 1

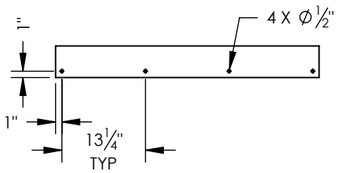
					SCALE:	NTS	
					DRAWN:	12/06/11	LC
A	CHANGED PER CUSTOMER COMMENTS	HD	LC	4/4/12	CHECKED:	12/06/11	LC
REV.	DESCRIPTION	DRAWN	APPD.	DATE	APPROVED:		

TITLE:
LEVEL CONTROL WEIR
AQUARAY 40 HO VLS DISINFECTION SYSTEM
HAROLD D. THOMPSON REGIONAL WRF - FOUNTAIN, CO.

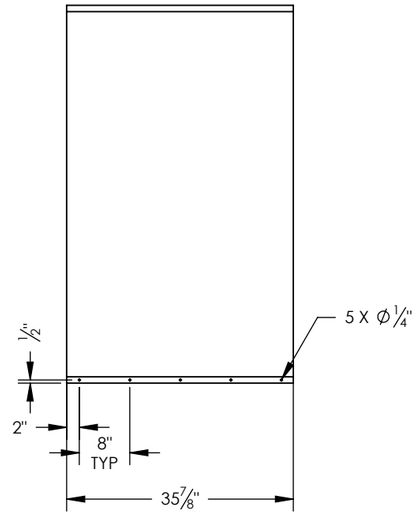
OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NEW JERSEY 07605

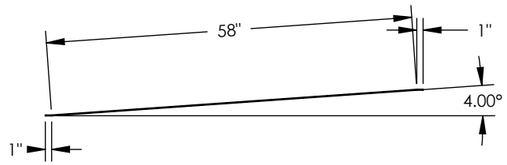
SHT.: 1 OF 3
SIZE: B
DWG. NO.: 18253-11-0601
REV.: A



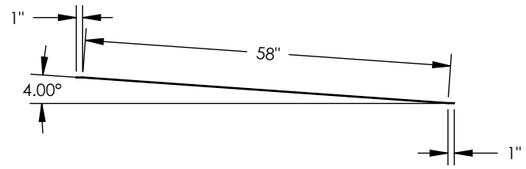


BOTTOM PLATE

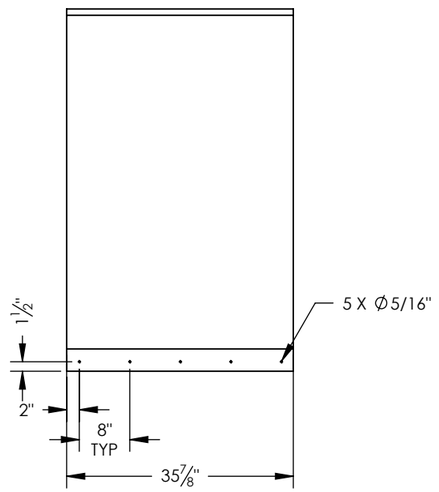


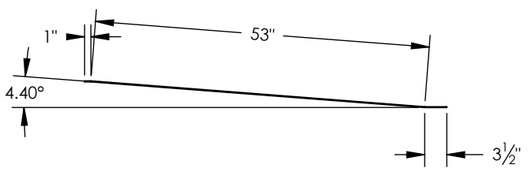


(2) QTY. 5
(1 WITH HOLES
4 WITH NO HOLES)



(2.1) QTY. 4
(WITH NO HOLES)





(2.2) QTY. 1

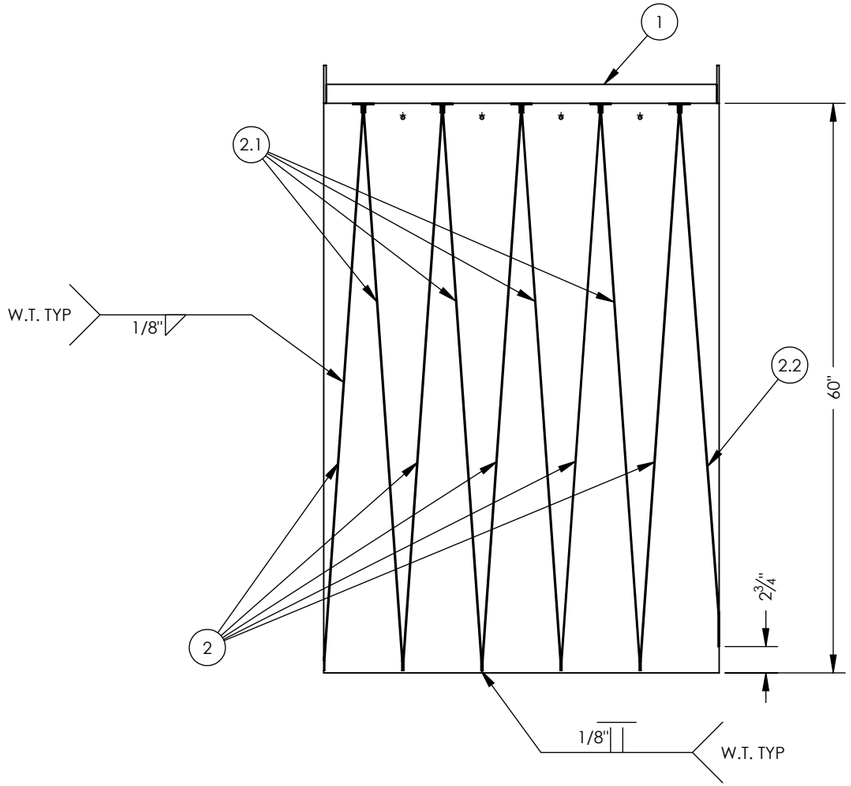
REV.	DESCRIPTION	DRAWN	APPD.	DATE
A	CHANGED PER CUSTOMER COMMENTS	HD	LC	4/4/12

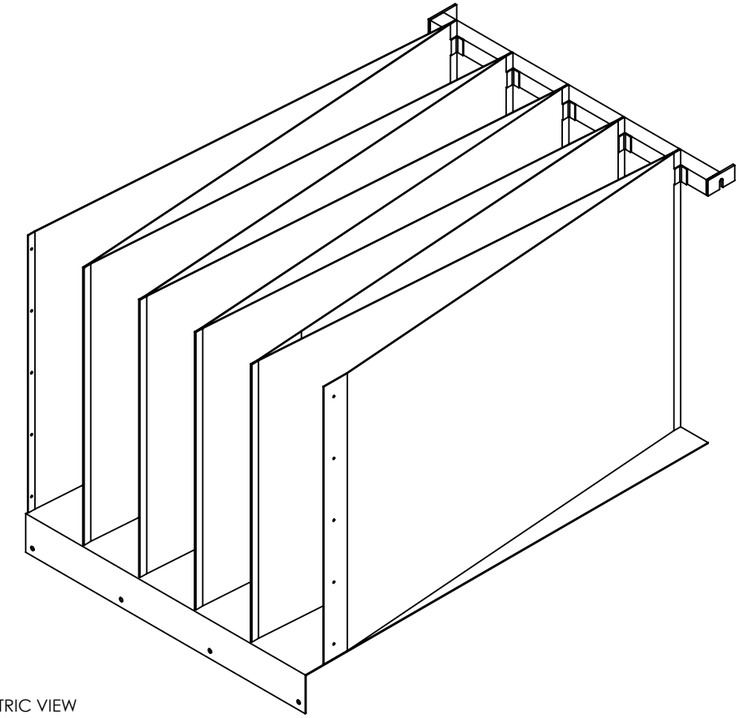
SCALE: NTS
DRAWN: 12/06/11 LC
CHECKED: 12/06/11 LC
APPROVED:

TITLE:
LEVEL CONTROL WEIR
AQUARAY 40 HO VLS DISINFECTION SYSTEM
HAROLD D. THOMPSON REGIONAL WRF - FOUNTAIN, CO.

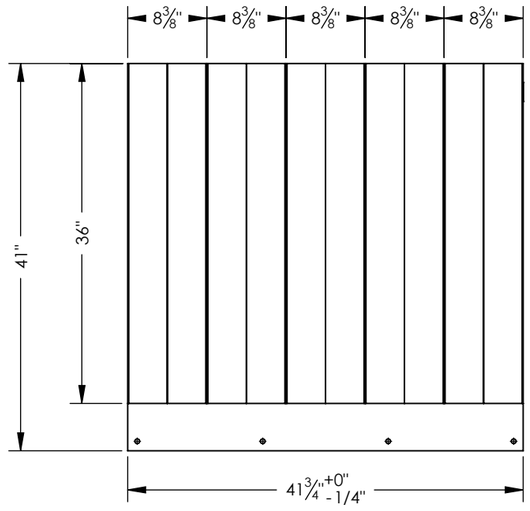
OZONIA
OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NEW JERSEY 07605

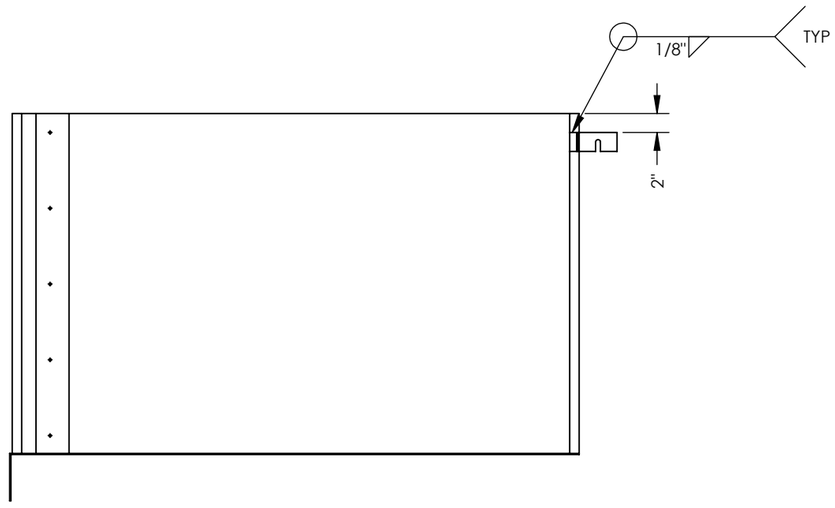
SHT.: 2 OF 3
SIZE: B
DWG. NO.: 18253-11-0601
REV.: A





ISOMETRIC VIEW





REV.	DESCRIPTION	DRAWN	APPD.	DATE
A	CHANGED PER CUSTOMER COMMENTS	HD	LC	4/4/12

SCALE: NTS
DRAWN: 12/06/11 LC
CHECKED: 12/06/11 LC
APPROVED:

TITLE:
LEVEL CONTROL WEIR
AQUARAY 40 HO VLS DISINFECTION SYSTEM
HAROLD D. THOMPSON REGIONAL WRF - FOUNTAIN, CO.

OZONIA
OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NEW JERSEY 07605

SHT.: 3 OF 3
SIZE: B
DWG. NO.: 18253-11-0601
REV.: A

Item	P/N	Description	Quantity		
		SYSTEM INSTRUMENT			
1	See Ref. 18000-04-0511	UV Intensity Sensor & Mounting Assembly	2		
2	2900-B3-S1-C1-50'FT	CONERY 2900 MECHANICAL SERIES FLOAT	1		
		SWITCH – CONTROL DUTY N/O 240V			
3	C20	CONERY RELEASABLE CABLE PIPE BAND CLAMP	1		

OZONIA North America
600 Willow Tree Road, Leonia NJ 07605

SYSTEM INSTRUMENT	**Sht. 1 of 1**	**Rev. (-)**	**Issued:01 11/11/11**
	Dwg.		
Fountain, CO	**A**	**18253-04-0001**	

THIS PAGE IS INTENTIONALLY LEFT BLANK

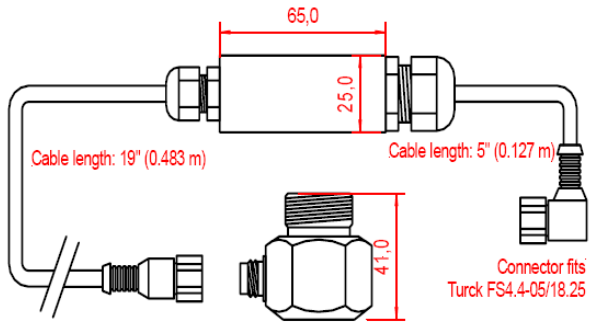
SWW1 PHOTOSENSOR SPECIFICATION DATA SHEET

Pic. 1: SWW1 Sensor

Due to the integrated electronics the sensor can directly be connected to a control unit (e.g. PLC) for UV-lamp monitoring, adjustment and control using a shielded cable.

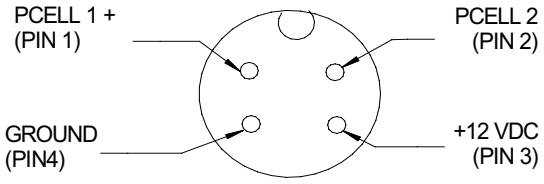
Technical Data

Dimensions:	Bolt 32 mm
Thread:	R 3/4" Length 14 mm
Total length:	41 mm
Material:	1.4571 stainless steel
Weight:	420 g
Voltage:	+ 12VDC
Current:	< 10 mA
Range:	0 .. 200 W/m2
Output signal	0 .. 5V
Spectral range:	180 - 290 nm
Selectivity:	above 280 nm better than 4 % for low-pressure mercury lamps, around 650 nm remaining sensitivity.
Operating temp.:	0 to +40 °C
Storage temp.:	-10 to +40 °C
Humidity:	< 80 %, not condensing
Connector:	Sensor female angle round connector M12x1 moulded on cable.



Pic. 2: Dimensions of the SWW1 sensor

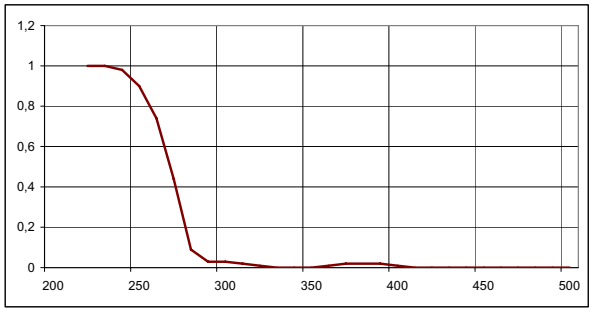
Connector layout



CHECKED: JPS 07/03/08	TITLE: UV Sensor SWW1 Specification			SHT: 1 of 2
APPROVED:	OZONIA NORTH AMERICA 491 EDWARD H. ROSS DRIVE ELMWOOD PARK, NJ 07407	A	DWG No. 18000-04-0511	REV: -

General Description

The SWW1 sensor is a very rigid, waterproof UV-Sensor of high stability. Over a period of 1 year deterioration is not detectable. The sensor is totally submergible up to a depth of 1 meter. It converts incident photons of appropriate wavelength (UVC) into visible radiation. This visible radiation is proportional to the UVC-irradiance and is detected by a silicon-photodiode, which converts radiation into a proportional current signal.



Pic. 3 Sensitivity of the SWW1 sensor

CHECKED: JPS 07/03/08	TITLE: UV Sensor SWW1 Specification			SHT: 2 of 2
APPROVED:	OZONIA NORTH AMERICA 491 EDWARD H. ROSS DRIVE ELMWOOD PARK, NJ 07407	A	DWG No. 18000-04-0511	REV: -

PHOTOSENSOR INSTALLATION AND OPERATION INSTRUCTIONS

SWW1 PHOTOSENSOR

NOTE THAT THESE INSTRUCTIONS ARE SPECIFIC TO THE PHOTOSENSOR INSTALLATION FOR A VERTICAL 40-LAMP MODULE, AQUARAY 40 "HO" SYSTEM.

INSTALLATION:

The SWW1 sensor assembly (ONA #X0017-H06) consists of a sensor head, amplifier, and interconnecting wires. The amplifier mounting bracket and nut, plastic sensor attachment nut, and o-ring are included with the sensor. Install sensor and amplifier in the module as shown on the attached drawings. The sensor head mounts on the baffle-mounted bracket and the amplifier mounts on the stud on the bottom of the enclosure using the mounting bracket supplied with the sensor.

NOTE THAT THE SENSOR AND AMPLIFIER ARE A MATED SET, THEY ARE FACTORY-CALIBRATED TOGETHER. DO NOT SWAP COMPONENTS, IMPROPER READINGS WILL RESULT.

OPERATION:

The intensity failure alarm setpoint is normally set for intensities of 1 mw/cm^2 or below. This is based on factory calibration values, indicating that either the lamp is old (lamps last approximately 1 year), the jacket is dirty/fouled, or the water is of poor quality, normally a combination of all of these factors result in the low reading. Generally, the sensor is used as a relative indicator for jacket fouling, indicating that the modules should be cleaned.

CLEANING:

The window of the sensor may require periodic cleaning, approximately once every few months or when sensor readings are abnormally low (depending largely on water quality). To clean the sensor, wipe the window with a 2% citric acid solution.

TROUBLESHOOTING:

If the sensor readings are very low or very high, the voltage on the sensor input should be verified. The voltage should be between 0 VDC and 5 VDC, normal operating range in typical effluent (65%) with newer lamps and relatively clean jackets will result in readings of approximately 3 VDC. Voltage should be verified between the white and green wires on the harness which connects the sensor receptacle to the DCA – you can wedge the multimeter leads in the back of the connector, run the wires outside of the module and close the lid, then apply power to verify the voltage on the wires.

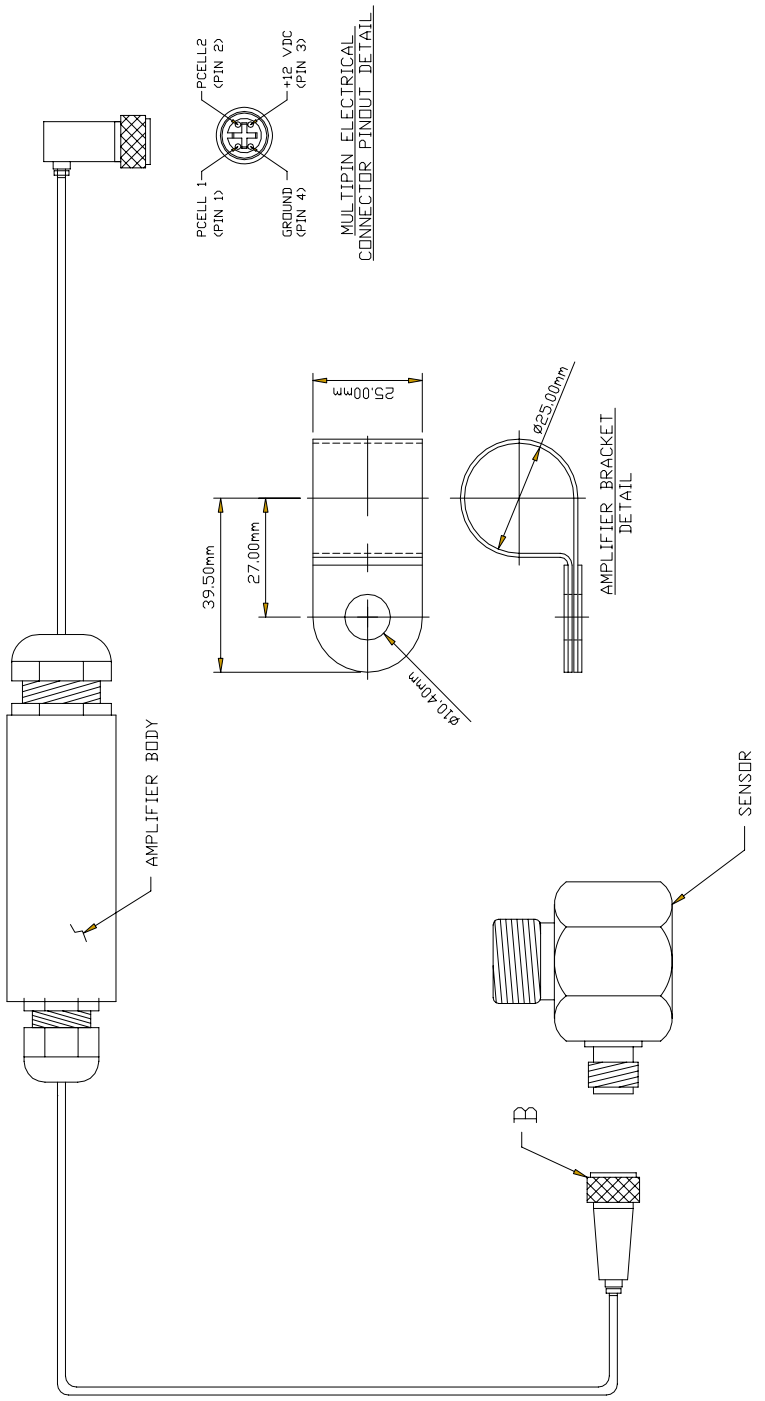
If the output is 0 VDC the wiring should be verified, there is probably a break in the wiring. If the sensor reads 5 VDC the sensor should be replaced, then the voltage verified. 5 VDC readings usually indicate that the sensor has failed.

Any time that a lamp is started up be sure to wait for approximately 10 minutes for the lamp to come up to full power and the sensor reading to stabilize before taking any readings.

CHECKED: WY 03/16/2006	TITLE: SWW1 PHOTOSENSOR INSTALLATION AND OPERATION INSTRUCTIONS			SHT: 1 of 5
APPROVED:	OZONIA NORTH AMERICA 600 Willow Tree Road Leonia, NJ 07605	A	DWG No. 18000-77-0074	REV: -

If your sensor is reading low (verified by voltage readings in the module):

- Ensure that the lamps are turned on in the module with the sensor. Make sure that lamp is operating.
- Ensure that the jackets are clean, the lamps are not old, and the effluent is of acceptable quality. The lamps have a useful life of about 1 year, if the lamp being monitored is old put a new one in. If the jackets are dirty, clean the module (use scotch brite and lime away to clean the jacket if the sensor still does not read; if scotch brite brings the intensity back, the modules need to be more thoroughly cleaned) . The wastewater should have a UV Transmittance of about 65% (this is average, some sites are designed for lower or higher UVTs).
- Ensure that the sensor is clean (see cleaning instruction above).



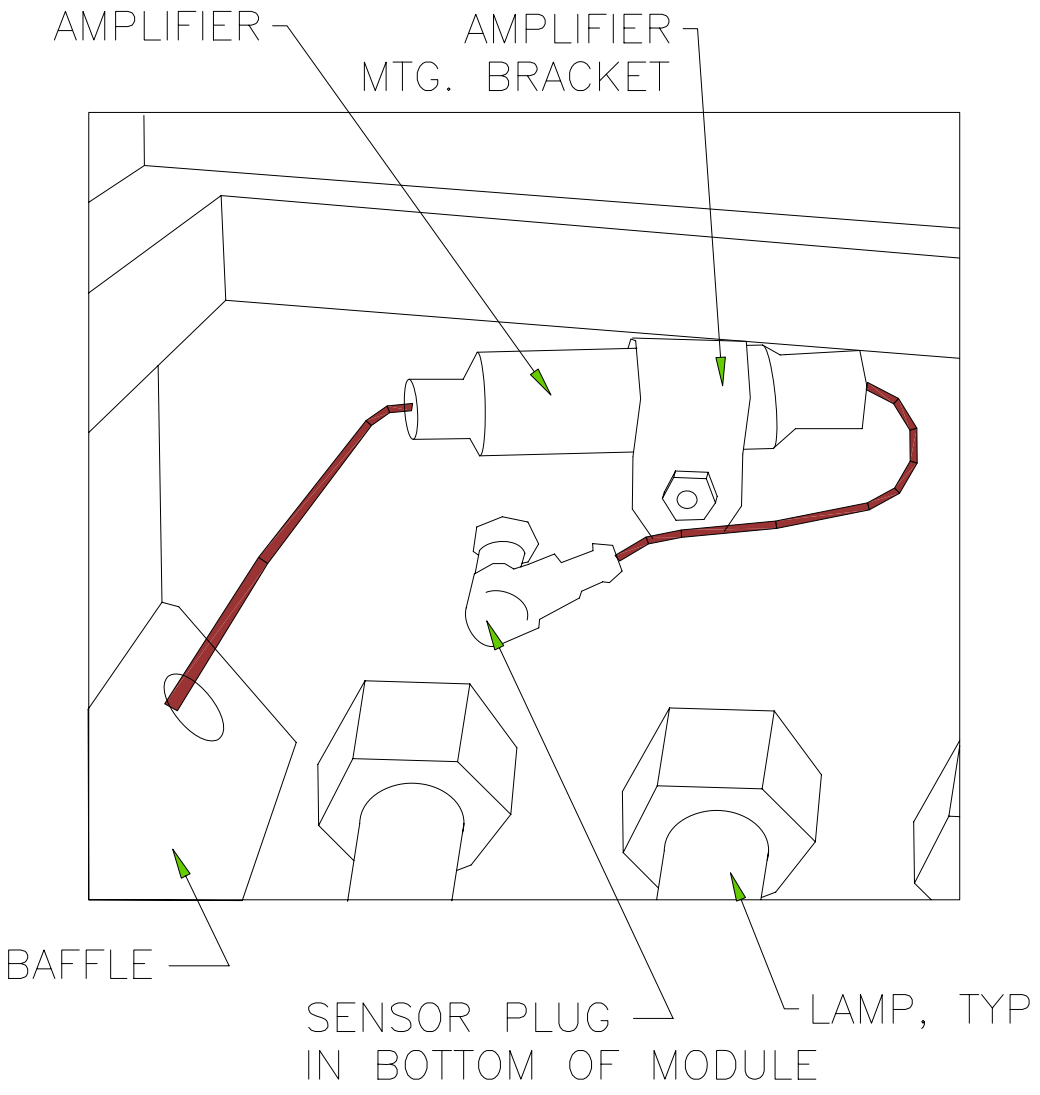
SUBMERSIBLE UV SENSOR MODEL SWW1

P/N 61848-G01

NOTE: EACH SENSOR TO BE INDIVIDUALLY PACKAGED WITH THE FOLLOWING:

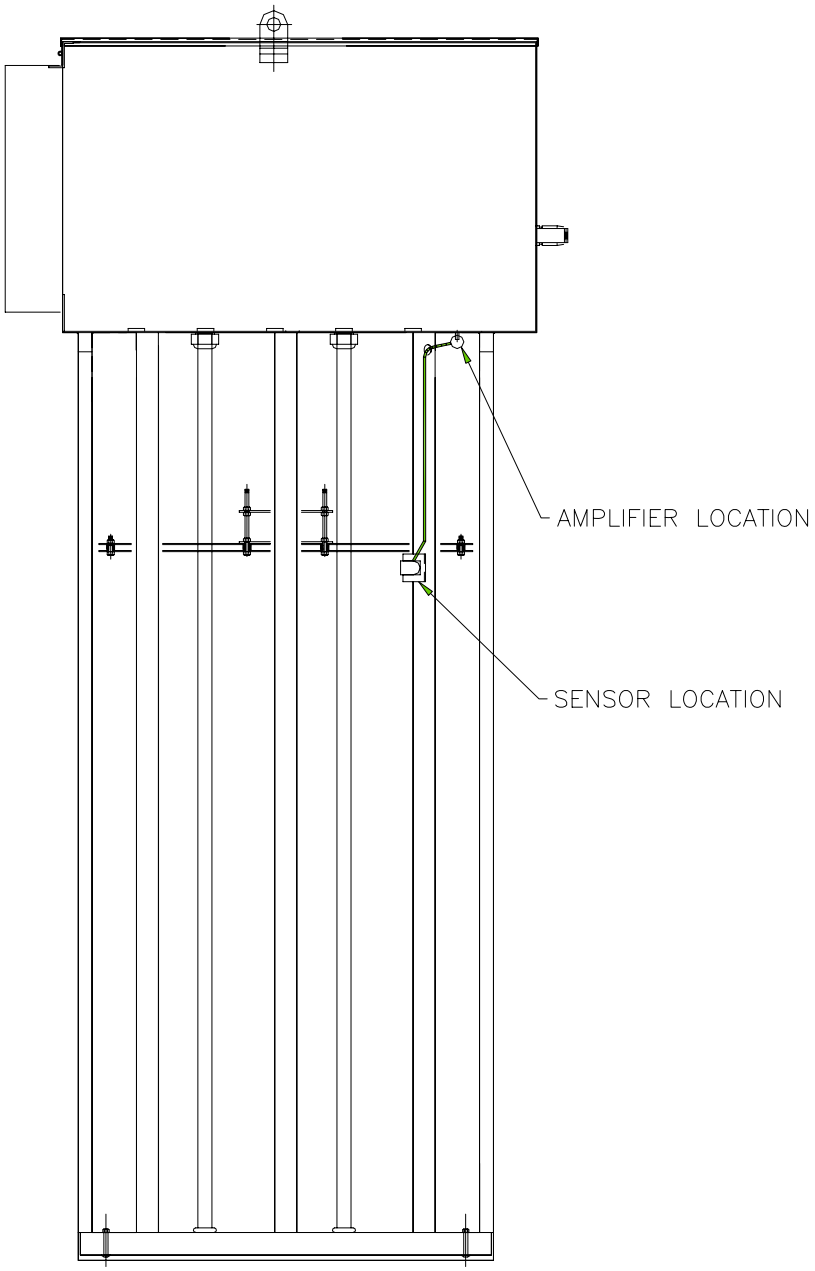
(1) NUT, HUBBELL # 31622007LPK50
(1) NUT, #10-24, STAINLESS STEEL
(1) AMPLIFIER BRACKET W/M10 HOLE (SEE DETAIL)
(1) O-RING

CHECKED: WY 03/16/2006	TITLE: **SWW1 PHOTOSENSOR INSTALLATION AND OPERATION INSTRUCTIONS**			SHT: 3 of 5
APPROVED:	OZONIA NORTH AMERICA 600 Willow Tree Road Leonia, NJ 07605	A	DWG No. 18000-77-0074	REV: -



SENSOR INSTALLATION - AMPLIFIER DETAIL
VIEWED FROM BELOW

CHECKED: WY 03/16/2006	TITLE: **SWW1 PHOTOSENSOR INSTALLATION AND OPERATION INSTRUCTIONS**			SHT: 4 of 5
APPROVED:	OZONIA NORTH AMERICA 600 Willow Tree Road Leonia, NJ 07605	A	DWG No. 18000-77-0074	REV: -



SENSOR INSTALLATION LOCATION

CHECKED: WY 03/16/2006	TITLE: **SWW1 PHOTOSENSOR INSTALLATION AND OPERATION INSTRUCTIONS**			SHT: 5 of 5
APPROVED:	OZONIA NORTH AMERICA 600 Willow Tree Road Leonia, NJ 07605	A	DWG No. 18000-77-0074	REV: -

THIS PAGE IS INTENTIONALLY LEFT BLANK

ITEM#	QTY	DESCRIPTION	MANUF/SUPPL	MODEL#	PART#	OZONIA#	SIZE	MATERIAL	FINISH
-	1	LEVEL SWITCH	CONNERY MFG. INC		-	X0063	-	-	

WHERE USED:

ALL AQUARAY VERTICAL UV INSTALLATION.

MANUFACTURER ADDRESS:

CONNERY MFG. INC.

1380 ENTERPRISE PKWY.

ASHLAND, OH. 44805

SUPPLIER ADDRESS:

SPECIFICATION:

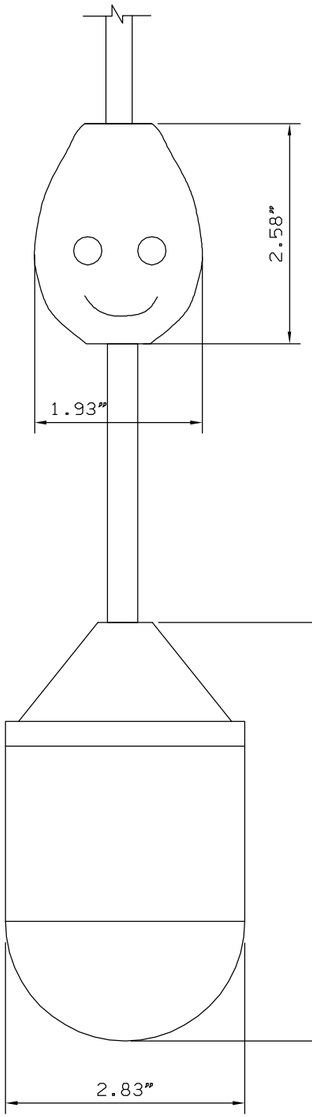
NORMALLY OPEN/CLOSED CONTROL DUTY FLOAT SWITCH

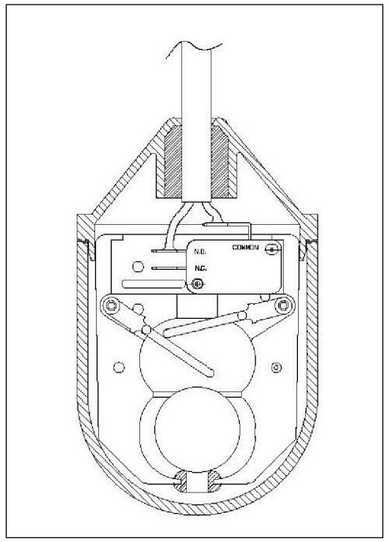
SINGLE POLE - DOUBLE THROW (SPDT)

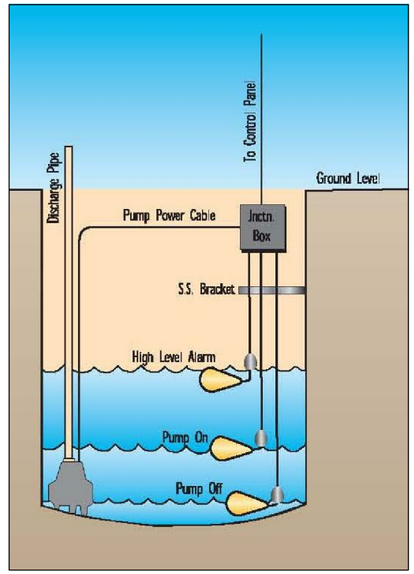
10 AMP @ 120 VAC NARROW ANGLE MERCURY SWITCH

NOTES:

1. IDI REFERENCES:
   DWG No.- REV. -
2. UNLESS OTHERWISE SPECIFIED
   ALL DIMENSIONS ARE IN INCHES.







DESCRIPTION	MANUF/SUPPL	LENGTH	PART#	OZONIA#
LEVEL SWITCH	CONNERY MFG. INC	50 FT	2902-B8-S2-C3-50	X0063-H01
LEVEL SWITCH	CONNERY MFG. INC	70 FT	2902-B8-S2-C3-70	X0063-H02
LEVEL SWITCH	CONNERY MFG. INC	100 FT	2902-B8-S2-C3-100	X0063-H03

REV.	DESCRIPTION	DRAWN	APPD.	DATE

SCALE: NONE
DRAWN: 04/07/10 MDL
CHECKED: 04/07/10 MDL
APPROVED:

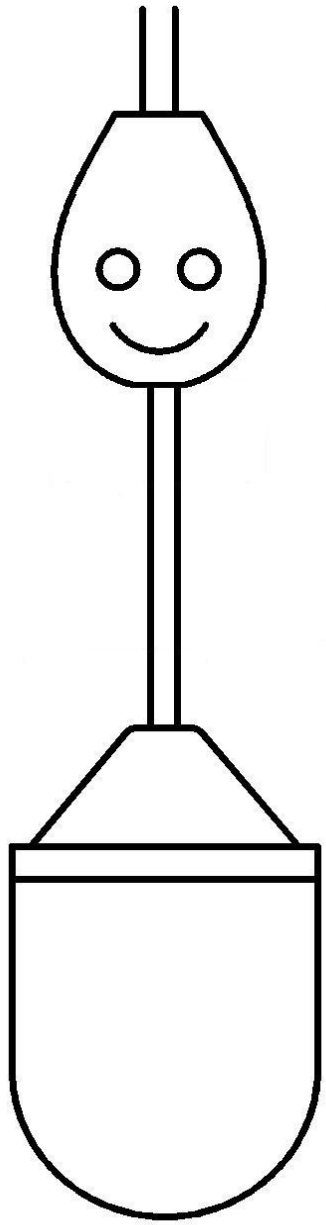
TITLE: DUTY FLOAT LEVEL SWITCH

OZONIA NORTH AMERICA
600 WILLOW TREE ROAD
LEONIA, NJ 07605 USA

SHT.: 1 OF 1
SIZE: D
DWG. NO.: X0063
REV.:

FLOAT SWITCH – CONTROL DUTY

2900 MECHANICAL SERIES – NARROW ANGLE FLOAT SWITCH



GENERAL

DESIGNED FOR ACCURATE LIQUID LEVEL CONTROL IN MANY APPLICATIONS INCLUDING POTABLE WATER OR SEWAGE ENVIRONMENTS. THE FLOAT SWITCH CAN BE UTILIZED TO SIGNIFY SPECIFIC WATER LEVELS OR FOR DIRECT ALARM ACTUATION.

SWITCH VARIATIONS

NORMALLY OPEN (N/O)

THE CONTACTS ARE OPEN (OR OFF) IN THE HANGING POSITION. AS THE FLOAT RISES 1" (5°) ABOVE HORIZONTAL, THE CONTACTS BECOME CLOSED AND ACTUATE (TURN ON) THE SWITCH. THIS FLOAT IS GENERALLY USED IN PUMP DOWN APPLICATIONS.

NORMALLY CLOSED (N/C)

THE CONTACTS ARE CLOSED (OR ON) IN THE HANGING POSITION. AS THE FLOAT RISES 1" (5°) ABOVE HORIZONTAL, THE CONTACTS BECOME OPEN AND ACTUATE (TURN OFF) THE SWITCH. THIS FLOAT IS GENERALLY USED IN PUMP UP APPLICATIONS.

SINGLE POLE, DOUBLE THROW (SPDT)

A VARIATION OF THE PREVIOUSLY LISTED SWITCHES. THIS FLOAT SWITCH CAN BE WIRED TO OPERATE AS EITHER (BUT NOT BOTH) A NORMALLY OPEN OR NORMALLY CLOSED SWITCH BASED ON THE USER'S NEED.

SWITCH SPECIFICATIONS

2900 SERIES MECHANICAL FLOAT SWITCHES ARE DESIGNED TO OPERATE UNDER THE FOLLOWING PARAMETERS.

MINIMUM OPERATING TEMPERATURE	-	32 DEGREES F.
MAXIMUM OPERATING TEMPERATURE	-	190 DEGREES F.
ELECTRICAL RATING	-	10 AMP – 120 VAC, 5 AMP – 240 VAC
ACTUATION POINT	-	1" ABOVE / BELOW HORIZONTAL.

POWER CORD SPECIFICATIONS

CONDUCTOR CORD – PHYSICAL	-	CHLORINATED POLY ETHYLENE.
ELECTRICAL FOR N/O OR N/C SWITCH	-	16 AWG 2, TYPE SJOW-300 VOLT.
ELECTRICAL FOR SPDT SWITCH	-	16 AWG 3, TYPE SJOW-300 VOLT.

FLOAT SPECIFICATIONS

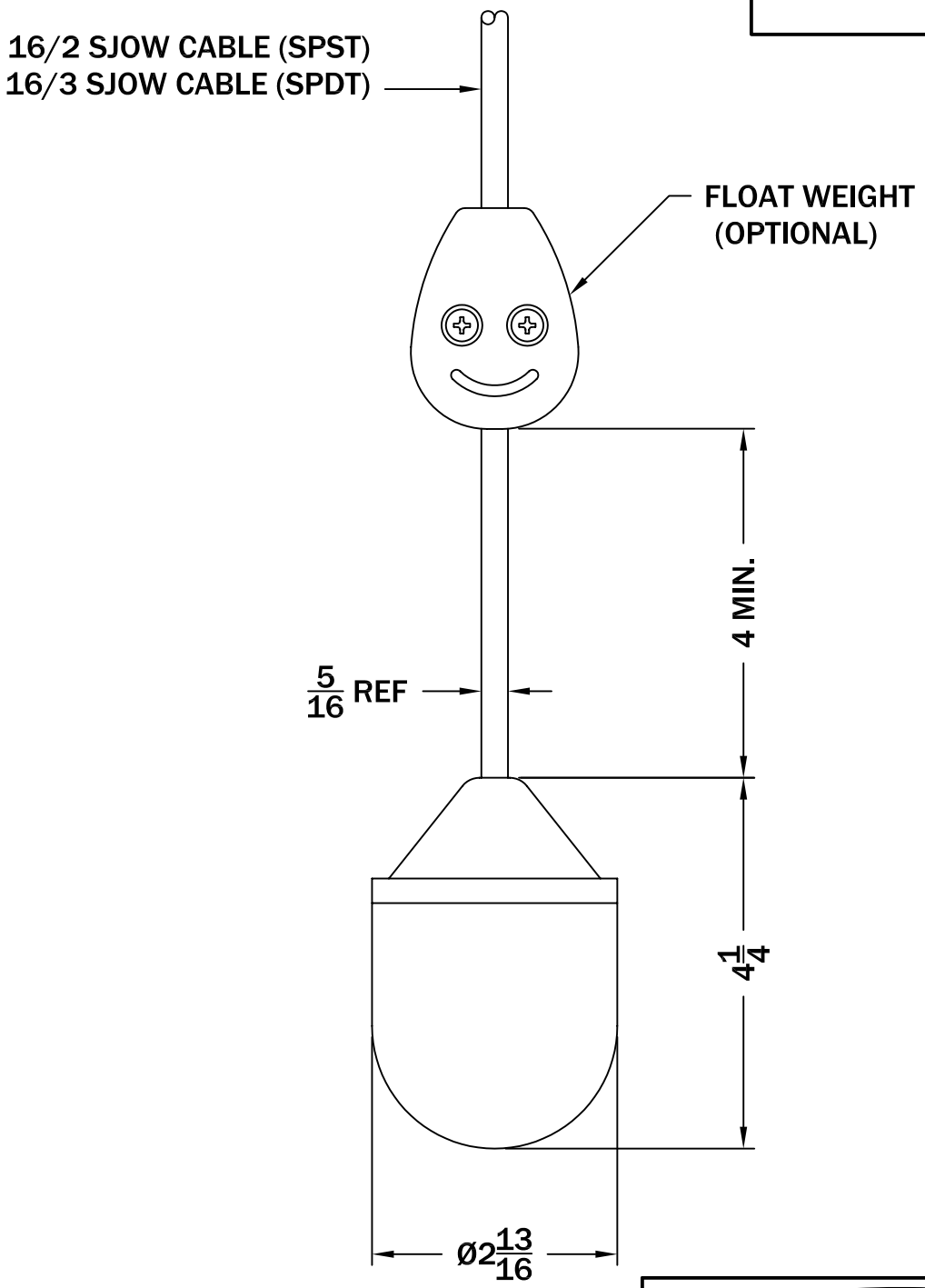
DURABLE ABS MATERIAL CONSTRUCTION.
LEAK PROOF, SHOCK PROOF, AND IMPACT RESISTANT.
RESISTANT TO SEWAGE AND WASTEWATER APPLICATIONS.
FOR USE WITH INTRINSICALLY SAFE CIRCUITS.

CORD WEIGHT

ZINC PLATED CAST IRON – 1.22 LBS.
SPLIT WEIGHT DESIGN ALLOWS FOR EASY ADJUSTMENT.
DESIGN ALLOWS FOR SECURE AND PERMANENT ATTACHMENT TO CORD.

CONERY MFG INC 1380 ENTERPRISE PARKWAY ASHLAND, OH 44805
info@conerymfg.com PH (419) 289-1444 FAX (419) 281-0366

2900 SERIES B3



CONERY MFG INC

CHANGES		TOLERANCES	DRAWN BY	DATE
F		DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	02/20/04
E			MATERIAL SPECIFICATION: NARROW ANGLE MECHANICAL FLOAT	
D				
C				
B				
A				

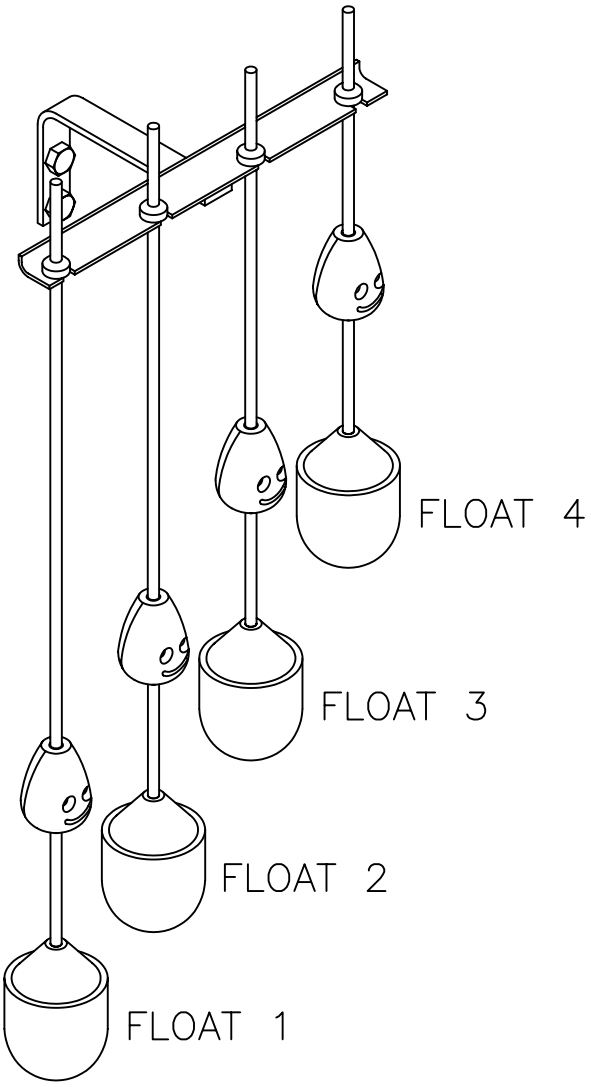
SPECIFICATION SHEET
MECHANICAL FLOAT

SCALE:	PART NO.
HALF	2900 SERIES B3

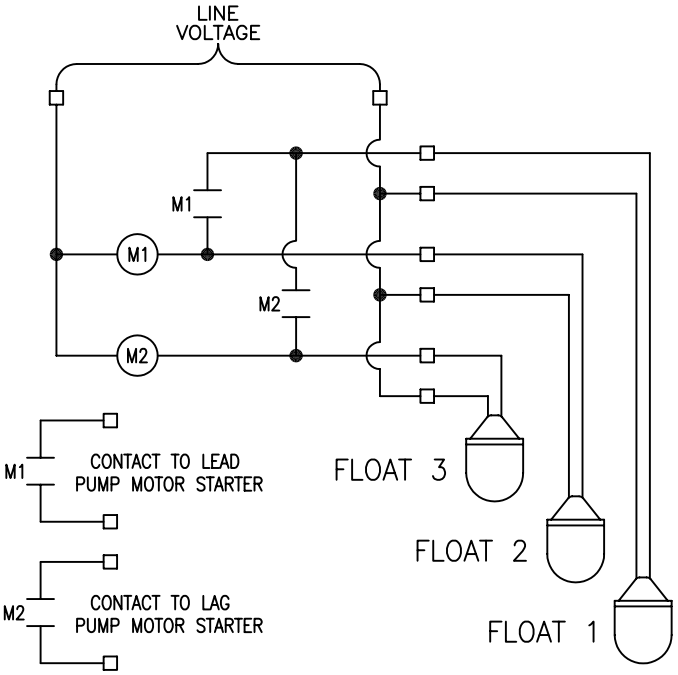
NOTE: ALL ELECTRICAL DIAGRAMS SHOWN ARE EXAMPLES ONLY, CONSULT WITH LOCAL ELECTRICAL AUTHORITIES AND CODES. DO NOT USE THESE PRODUCTS IN GASOLINE, VOLATILES, OTHER COMBUSTIBLES.

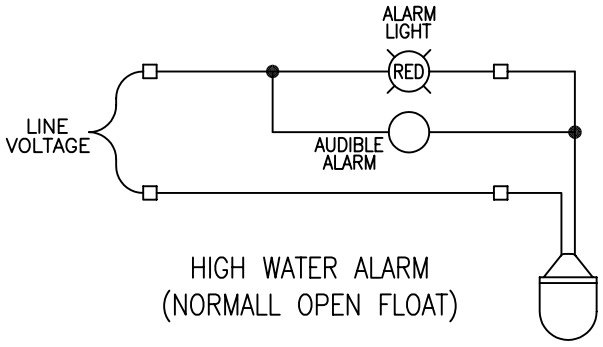
2900 SERIES B3

TYPICAL MOUNTING



FOR PUMP DOWN USE (NORMALLY OPEN FLOATS) FOR PUMP UP USE (NORMALLY CLOSED FLOATS)





HIGH WATER ALARM
(NORMALL OPEN FLOAT)

CONERY MFG INC

CHANGES		TOLERANCES	DRAWN BY	DATE
F		DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	02/20/04
E			MATERIAL SPECIFICATION: NARROW ANGLE MECHANICAL FLOAT	
D				
C				
B				
A				

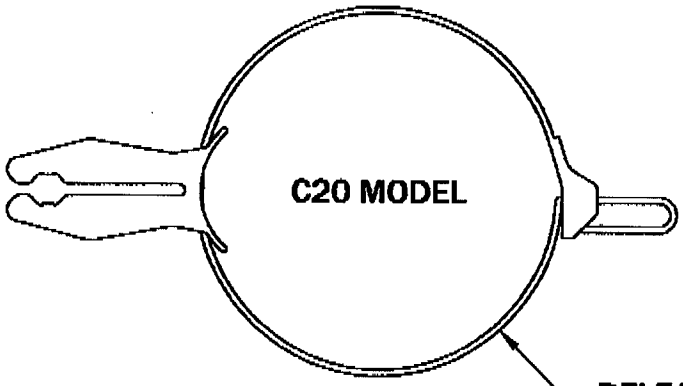
SPECIFICATION SHEET
MECHANICAL FLOAT

SCALE:	PART NO.
NONE	2900 SERIES B3

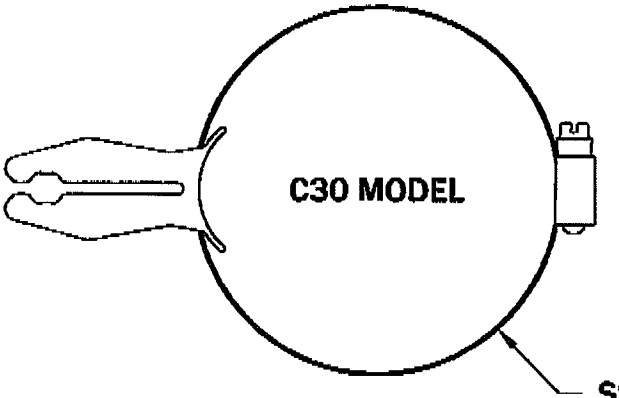
THIS PAGE IS INTENTIONALLY LEFT BLANK

MOUNTING DEVICES

PAGE 1

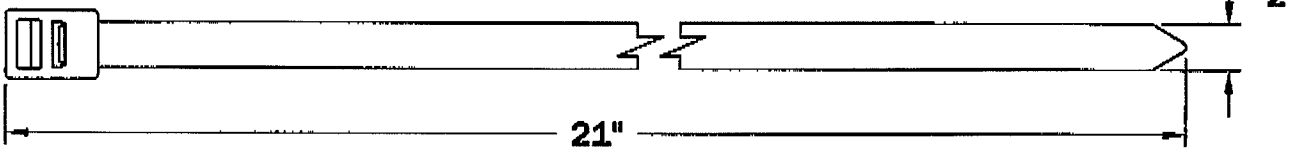


RELEASABLE POLY BAND CLAMP
RANGE: Ø1" - Ø5"



SST PIPE CLAMP
RANGE: Ø$\frac{3}{4}$" - Ø3$\frac{1}{2}$"

C40 MODEL
POLY BAND
CLAMP ONY



CONERY MFG INC

CHANGES	TOLERANCES	DRAWN BY	DATE
F	DECIMALS .XXX = ±.005 .XX = ±.010 FRACTIONAL X/X = ±.1/64 ANGLES X° = ±1/2°	D. MIDDLETON	02/20/04
E		MATERIAL SPECIFICATION:	
D			
C			
B			
A			

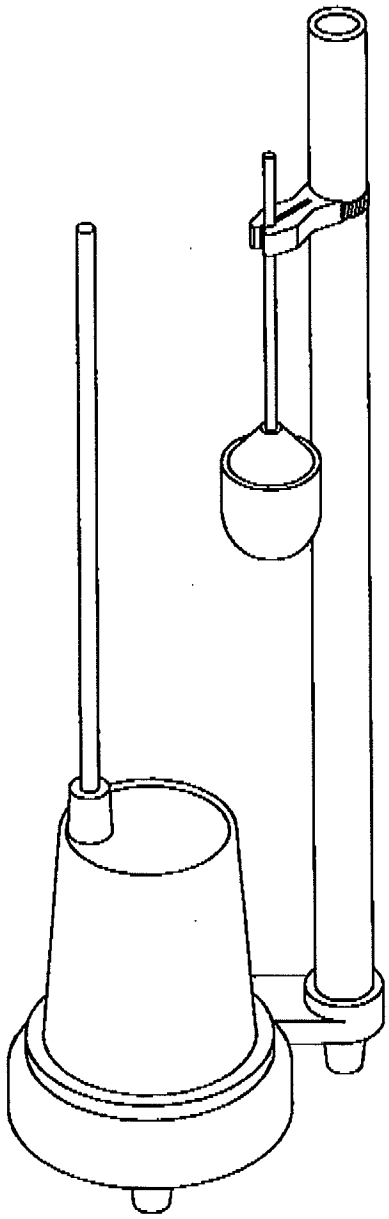
SPECIFICATION SHEET
DIMENSIONAL DATA

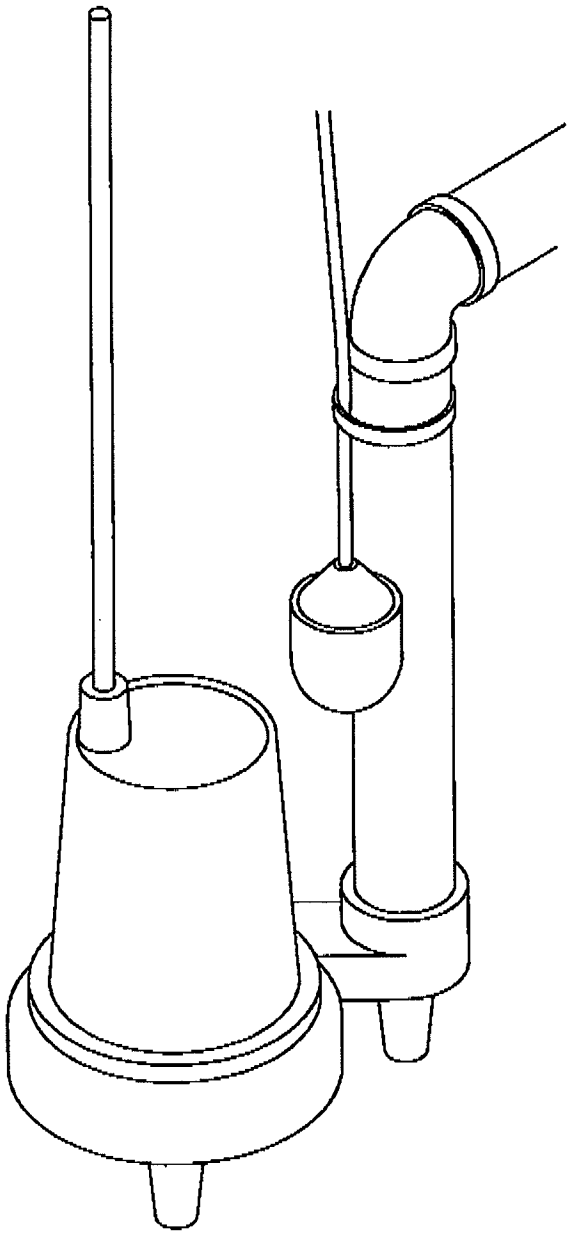
SCALE:	PART NO.
HALF	C20, C30, C40

TYPICAL MOUNTING

MOUNTING DEVICES

PAGE 2





CONERY MFG INC

CHANGES	TOLERANCES	DRAWN BY	DATE
F	DECIMALS	D. MIDDLETON	02/20/04
E	.XXX = ±.005		
D	.XX = ±.010	MATERIAL SPECIFICATION:	
C	FRACTIONAL		
B	X/X = ±1/64		
A	ANGLES		
	X° = ±1/2°		

SPECIFICATION SHEET DIMENSIONAL DATA

SCALE:	PART NO.
NONE	C20, C30, C40

Item	P/N	Description	Quantity		
		SYSTEM POWER SUPPLY			
1	DA27H1S1	Step Down Transformer 480/230V 27 KVA	1		

OZONIA North America
600 Willow Tree Road Leonia, NJ 07605

SYSTEM POWER SUPPLY	**Sht. 1 of 1**	**Rev. (A)**	**Issued: 04/23/12**
Fountain, CO	Dwg. **A**	**18253-08-0001**	

THIS PAGE IS INTENTIONALLY LEFT BLANK

REX POWER MAGNETICS
DIVISION OF TRANSFACTOR INDUSTRIES INC.
65 Basaltic Rd. Concord, ON, L4K 1G4 Canada
Tel: 905-695-8844, 1-800-387-2840 Fax: 905-695-8855
www.RexPowerMagnetics.com

TRANSFORMER SPECIFICATION

- 3 Phase Drive Isolation
- Dry Type
- ANN Self Cooled
- Suitable for Nonsinusoidal Current Load with a K-Factor not to exceed 4

PRELIMINARY DRAWING ONLY
This drawing may NOT truly reflect our Final Design. Any resulting order(s) must be accompanied by, or refer to this drawing and be marked with any proposed changes.

Purchaser: TBA
PO#: TBA
SWO#: TBA
Qty: TBA

Coils:	Aluminum	
Cat. No.:	DA27H1-S1	
kVA:	27	
Primary:	460	Delta Volts
Secondary:	230	Y/133 Volts
Primary Taps:	2.5	%
-Taps FCAN	2	
-Taps FCBN	2	
Frequency:	60	Hz
BIL:	10	kV
Insulation Class:	220º	C
Temperature Rise:	150º	C
Impedance:	4.5 - 5.5	%
Weight:	290	Lbs

Termination	Location	Lug Size
Primary:	Front	2-14 AWG
Secondary:	Front	2-14 AWG

Wiring Connection:

Primary: H1-H2-H3

Voltage	% Tap	Jumpers To:
483	105.0	1-1-1
472	102.5	2-2-2
460	100.0	3-3-3
449	97.5	4-4-4
437	95.0	5-5-5

Secondary: X0-X1-X2-X3

Voltage	Phase	Connect Loads To:
230	3	X1-X2-X3
133	1	X0-X1, X0-X2, and/or X0-X3

Standards:

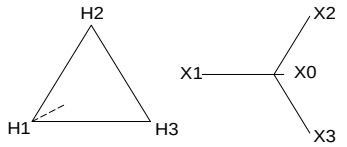
1. CSA Certified
   - File No. LR34493
2. UL Listed
   - File No. E108255

Standard Features:

1. Anti-vibration pads installed between the enclosure base and the core & coil assembly
2. Ground lug provided
3. Neutral Rated 200% of the Line Terminals
4. NC 200ºC thermostat installed at the centre coil

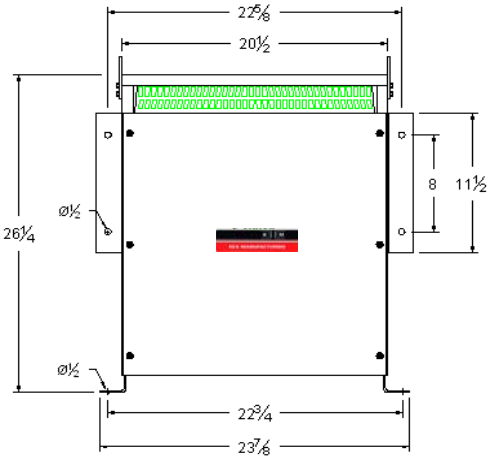
Special Features:

1. K-4 Rated

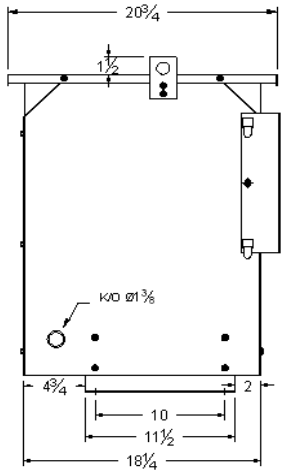


CSA Enclosure:

1. Type 3R (NEMA 3R)
   - Sprinklerproof when the angle between sprinkler heads and opening in the enclosure does Not exceed 45 degree from the vertical.
2. Ventilated
3. ASA 61 grey
4. Floor/Wall mounting



FRONT VIEW



SIDE VIEW

Rev.#	Remarks	By	Appr. By	Date

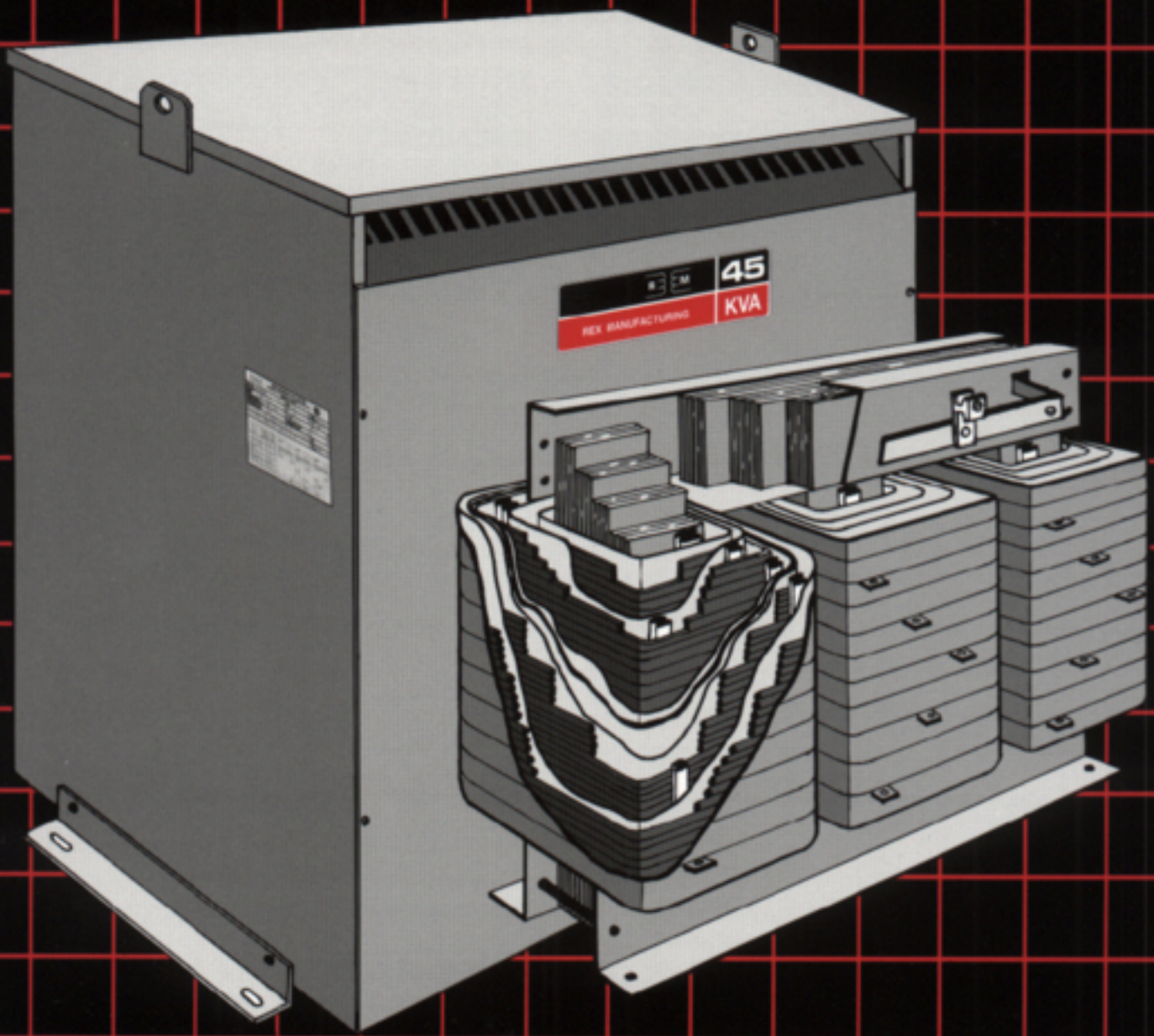
Prepared by: AP
Approved by: VS
Date: SEPT.13, 2011

X:\Drawings\NONC802\3P\ISO\DA27H1-S1 (REV).xls

THIS PAGE IS INTENTIONALLY LEFT BLANK

DRY TYPE TRANSFORMERS

- Distribution
- K-Factor Rated
- Energy Efficient
- Auto
- Shielded
- Encapsulated



catalogue no. 08/03

REX POWER MAGNETICS

DIVISION OF TRANSFACTOR INDUSTRIES INC.
REXDALE, ONTARIO

Catalogue Numbering System

B	C	30	J	M	XX
		KVA			
	A - Aluminum Windings C - Copper Windings		**PRIMARY VOLTAGE DESIGNATION**	**SECONDARY VOLTAGE DESIGNATION**	Special Requirements Codes:

R - 3 Phase Autotransformers
M - 1 Phase Auto ransformers
B - 3 Phase Isolation (Distribution)
S - 1 Phase Isolation (Distribution)
D - 3 Phase Drive Isolation

Primary and Secondary Voltage Letter Codes:

A - 120	F - 380	K - 120/240
A1 - 115	G - 416	K1 - 115/230
A2 - 110	G1 - 400	K2 - 110/220
B - 208	H - 480	L - 240/480
C - 240	H1 - 460	L1 - 230/460
C1 - 230	H2 - 440	L2 - 220/440
C2 - 220	J - 600	
D - 277	J1 - 575	
E - 347	J2 - 550	
M - 208Y/120	P2 - 440Y/254	S - 240Y/139
N - 416Y/240	Q - 600Y/347	S1 - 230Y/133
N1 - 400Y/231	Q1 - 575Y/332	S2 - 220Y/127
P - 480Y/277	Q2 - 550Y/318	
P1 - 460Y/266	R - 380Y/220	

X - Special
Use for any other voltage(s) not listed

50 - 50 Cycles (Hz)
Other Frequencies are available
S - Electrostatic Shield
E - Special Enclosure
T - Special Temperature Rise
K - K-Factor Rated
P - Special Paint Finish
M - Special Mounting Brackets
Z - Energy Efficient
EP - Encapsulated Transformer
(T115 is Standard with this feature)

- or
- Other unspecified
- suffixes

Index

Steps for selecting transformers

Steps for selecting required single phase transformer

1. Determine primary or supply voltage
2. Select secondary or load voltage
3. Verify single phase operation
4. Standard transformers are suitable for operation on a 60 Hz (Hertz) (cycle) system. Refer to factory for other frequencies.
5. Determine KVA rating of load. Select a transformer having a standard KVA rating equal to or greater than that required by the load.
6. Select autotransformer or double-wound isolation type. Formula for calculating single phase KVA:

$$KVA = \frac{Volts \times Amps}{1000}$$

Line currents at rated voltage single phase.

KVA	120 V	240 V	480 V	600 V
1	8.3	4.2	2.1	1.7
2	16.7	8.3	4.2	3.3
3	25.0	12.5	6.3	5.0
5	41.7	20.8	10.4	8.3
7.5	62.5	31.3	15.6	12.5
10	83.3	41.7	20.8	16.7
15	125.0	62.5	31.3	25.0
25	208.0	104.0	52.1	41.7
37.5	313.0	156.0	78.0	62.5
50	417.0	208.0	104.0	83.3
75	625.0	313.0	156.0	125.0
100	833.0	417.0	208.0	167.0
150	1250.0	625.0	313.0	250.0

Transformer rating for motor H.P.

Motor H.P. up to	.5	1	1.5	2	3	5	7.5	10
Actual KVA Required	1.16	1.9	2.30	2.76	3.92	6.45	9.23	11.5
Closest Standard KVA	2.0	3.0	3.0	3.0	5.0	7.5	10.0	15.0

Steps for selecting required three phase transformer

1. Determine primary or supply voltage
2. Select secondary or load voltage
3. Verify three phase operation
4. Standard transformers are suitable for operation on a 60 Hz (Hertz) (cycle) system. Refer to factory for other frequencies
5. Determine KVA capacity of load. Select a transformer having a standard KVA rating equal to or greater than that required by the load.
6. Select autotransformer or double wound isolation type. Formula for calculating three phase KVA:

$$KVA = \frac{Volts \times Amps \times 1.73}{1000}$$

Line currents at rated voltage three phase

KVA	208V	240V	480V	600V
3	8.3	7.2	3.6	2.9
6	16.6	14.4	7.2	5.8
9	25.0	21.7	10.7	8.7
15	41.7	36.1	18.1	14.5
30	83.4	72.3	36.1	28.9
45	125	108	54.2	43.4
75	208	181	90.3	72.3
112.5	313	271	135	108
150	417	361	181	145
225	625	542	271	217
300	834	723	361	289

Transformer rating for motor H.P.

Motor H.P.	2	3	5	7.5	10	15	20	25
Actual KVA Required	2.4	3.42	5.73	8.4	10.3	15	19.8	24.4
Closest Standard KVA	3.0	6.0	6.0	9.0	15	15	30	30

Construction

Core

- All Rex three phase transformers utilize three legged cores
- Only high quality grain oriented silicon steel is used
- Core steel is precision cut and stacked for reduced noise and losses
- Cores are clamped with heavy steel brackets

Coils

- All coil windings are of high quality magnet wire (copper or aluminum is available)
- Class 220 deg. C. insulation is utilized throughout the coil winding process
- All Rex transformers are designed with substantial cooling ducts for effective cooling
- Every coil is impregnated and baked in polyester resin varnish
- Standard ± 5% or ± 2X2.5% taps are provided on all isolation type transformers

Enclosures

- Standard enclosures are constructed of heavy gauge steel
- Ventilation openings are arranged so that each standard enclosure is suitable for either **NEMA** or **CSA** type 1 or type 2 applications
- All enclosures are designed to minimize the possibility of accidental contact with live parts and to restrict the access of falling particles into the transformer
- All Rex standard enclosures are finished in ASA 61 grey powder coating

UL Approval

Rex transformers are UL Listed File No. E108255.

CSA Approval

Rex transformers are manufactured in accordance with the requirements of CSA Standard C22.2 No 47 and certified under file number LR 34493.

Insulation System

Rex transformers are manufactured with insulating materials complying with CSA Winding Insulation System Class 220 as follows:

Maximum acceptable temperature rise based on an average ambient of 30C during any 24 h period and a maximum ambient of 40C at any time.

Altitude not to exceed 1000m (3000 ft)

Average winding temperature measured by rise of resistance	150C
Hottest spot temperature rise winding	180C
Maximum acceptable winding temperature	220C

Class 220 is the highest insulation level recognized by the transformer industry.

Quality Assurance and Testing

Rex Power Magnetics produces and tests all products in full compliance with the requirements of CSA Z299.3 and ISO 9001 quality assurance programs. All Rex Power Magnetics transformers are tested as per the requirements of CSA standard C9 M1981.

Optional Tests Available

- Temperature rise test
- Partial discharge (Corona) test
- Basic insulation impulse (BIL) test
- Sound level test

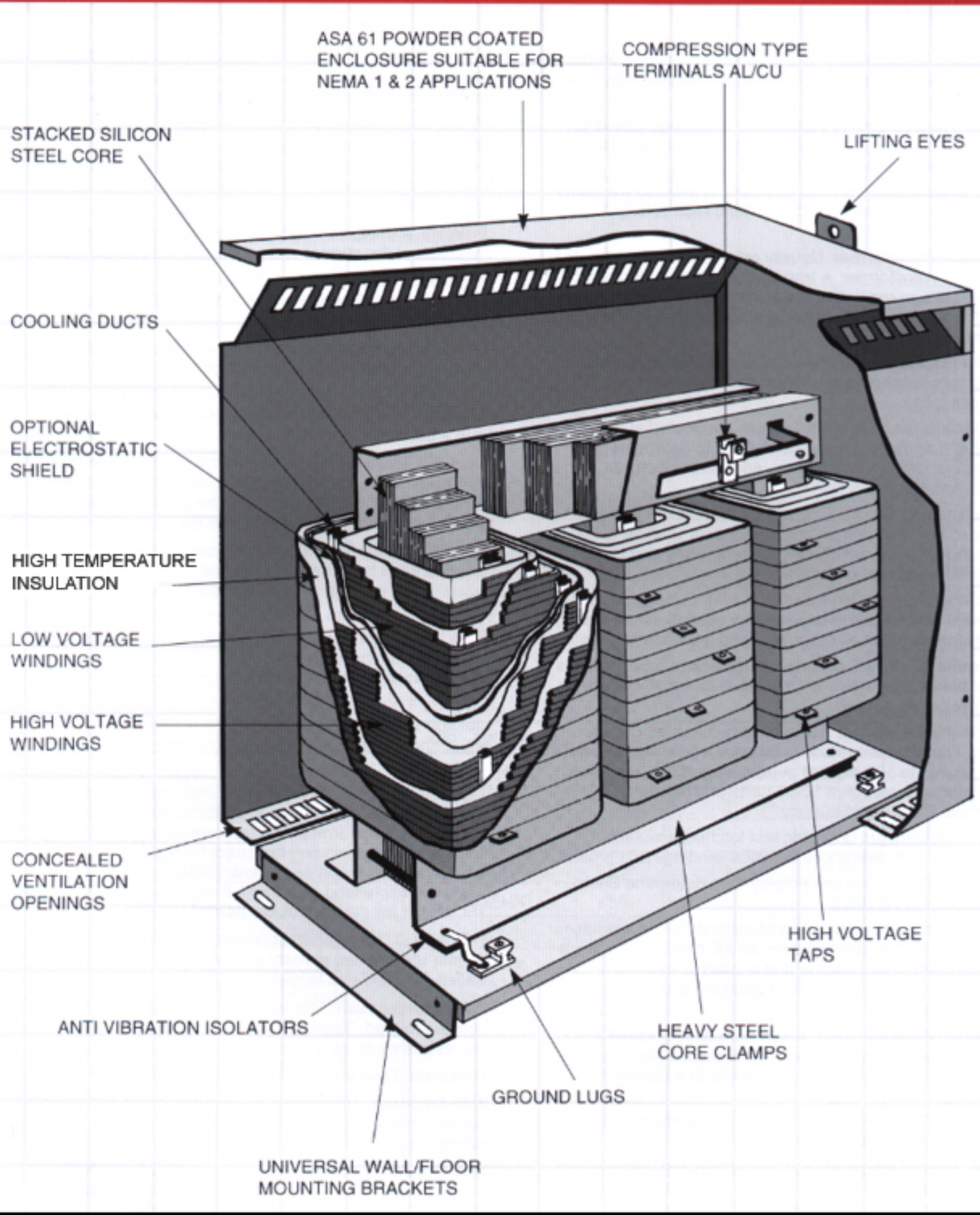
Available Options

Enclosures: NEMA and **CSA**

Type 2: ventilated, indoor, driproof (Rex Std.)
Type 3: ventilated indoor or outdoor weather resistant
Type 4: non ventilated indoor or outdoor watertight (protection against splashing and hose directed water)
Type 12: non ventilated indoor industrial dusttight and driproof

- Epoxy impregnated windings
- Epoxy cast coil designs
- 50 Hz designs (or other frequencies when specified)
- All non standard voltages
- Special configurations: delta - delta, delta or wye zig-zag
- Special impedance designs
- Temperature sensing devices
- Multiple windings
- Special tap arrangements
- Low audible noise designs
- Tropicalization
- Special paint available upon request
- Anti-vibration pads: all transformers have standard internal vibration isolators, external pads are available
- Lightning and surge arrestors
- Non sinusoidal load designs

Standard specifications, 600 V Class, single and three phase



Transformer Terms and Definitions

Ambient temperature The inherent or existing temperature of the atmosphere surrounding a transformer installation.

Auto-Transformer A transformer which has only one winding per phase, part of which is common to both primary and secondary circuits.

BIL Basic impulse level is a means to express the ability of the insulation system to withstand high voltage surges.

Control Transformer Usually referred to as an industrial Control Transformer. A transformer which is designed for good voltage regulation characteristics when low power factor, large inrush currents are drawn (5 to 15 times normal).

Delta (Δ) A standard three-phase connection in which each phase winding is connected in series to form a closed loop.

Dielectric Tests A series of tests conducted at much higher than rated nameplate voltage to determine the effectiveness of insulating materials and electrical clearances.

Electrostatic Shield Copper or other conducting sheet placed between primary and secondary winding and grounded to prevent electrical interference and to provide additional protection.

Exciting Current (No-Load Current) Existing current is current which flows in any winding used to excite the transformer when all other windings are open-circuited.

Frequency On AC circuits, designates number of times that polarity alternates from positive to negative such as 60 cycles per second.

Hertz (Hz) A term for AC frequency in cycles per second. Transformers rated for 60 hertz service should not be applied to 50 hertz, as overheating will occur. Certain transformers are rated 50/60 hertz and therefore, suitable for either frequency.

Hi Pot A standard dielectric test to check insulating materials and clearances between windings and ground.

Impulse Tests The test employed to determine Basic Insulation Level (BIL).

Impedance The vector sum of resistance and reactance which limits the current flow in an AC circuit. Impedance is identified in percentage and is used to determine the interrupting capacity of circuit breakers which protect the primary circuit.

Induced Potential Test A standard dielectric test which verifies the integrity of insulating materials and electrical clearances between turns and layers of a transformer winding.

Isolating Transformer A transformer which insulates the primary circuit from secondary circuit.

KVA Kilovolt Ampere rating designates the output which a transformer can deliver at rated voltage and frequency without exceeding a specified temperature rise.

Load Losses Load losses are those losses in a transformer which are incident to load carrying. Load losses include I^2R loss in the windings due to load current, stray loss due to stray fluxes in the winding, core clamps, etc... and to circulating currents (if any), in parallel windings.

No-Load Losses The losses incurred when a transformer is excited but without a load connected to the secondary. These include core loss, dielectric loss, and exciting current I^2R loss.

Polarity A designation of the relative instantaneous direction of the current in a secondary lead as compared with a primary lead.

Power Factor The relation of watts to volt amps in a circuit.

Ratio A reference to either the primary to secondary winding turns ratio or to the voltage ratio of the transformer.

Reactor A device for introducing inductive reactance into a circuit.

Rectifier Transformer A transformer designed to supply AC input to a rectifier to obtain the desired DC output and have the ability to withstand the heating effects caused by rectifier commutation or ripple.

Scott Connection A transformer connection usually used to get a two-phase output from the secondary of a transformer with a three-phase input to the primary, or vice versa.

Step Down Transformer One in which the high voltage winding is connected to the input or power source and the low voltage winding to the output or load.

Step Up Transformer A transformer in which the low voltage winding is connected to the power source or input and the high voltage winding is connected to the output load.

Tap A connection provided in a transformer winding which has the effect of changing the nominal voltage ratio of the transformer. The taps are usually placed on the high voltage winding to correct for high or low voltage conditions found on the low voltage output side. Taps are expressed as either full capacity above normal (FCAN) or full capacity below normal (FCBN).

T-CONNECTION A Scott connected three phase transformer utilizing two primary and two secondary coils called the main and teaser coils.

Temperature Rise The temperature increase over ambient due to load. This is measured as either average rise by resistance or as hot-spot.

Thermals Over temperature protection devices.

Volt-Amperes The current flowing in a circuit multiplied by the voltage of that circuit. An expression of the output rating of a transformer.

Wye Connection A three-phase connection in which similar ends of each phase winding are connected together at a common point which forms the electrical neutral and is often grounded.

Single phase isolation (double wound) transformers

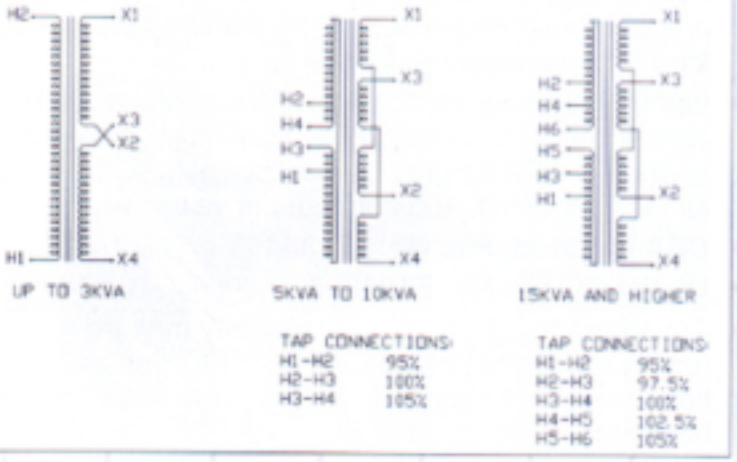
Application

Isolation transformers should be used on all systems which require grounding of the load.
Rex single phase distribution transformers are ideal for supplying auxiliary lighting circuits from 600 V and lower supplies, and electric heating equipment.

Features

- General purpose ventilated steel enclosure suitable for indoor, dry locations. After fabrication, all metal is finished in ASA 61 gray powder coating suitable for most industrial and commercial installations.
- Transformers up to 75 KVA capacity may be readily hung on H-columns, walls, shelves or floor mounted to suit each installation. Most units have lifting lugs, conduit KOs and a removable front cover for convenient access to terminals.
- Transformers rated above 75 KVA are suitable for floor or platform mounting and complete with integral lifting lugs and removable front panels for convenient access to terminals.
- Transformer terminations rated below 330 amps are supplied with suitable hardware and lugs for cable connection. Terminations above 330 amps are supplied with terminal pads only.
- Primary windings have full capacity taps for supply voltage compensation and split secondaries for flexibility.
- Class 220 insulation used throughout.
- **CSA certified, File No. LR 34493**
- **UL listed, File No. E108255**

TYPICAL ELECTRICAL AND TAP CONFIGURATIONS:



VOLTAGE	600 - 120 / 240	480 - 120 / 240			
KVA	Cat. No.	Cat. No.	Taps	Encl. Size*	WT.(lb.)
5	SC5JK	SC5HK	0	2	80
7.5	SC7JK	SC7HK	5%	4	100
10	SC10JK	SC10HK	5%	4	110
15	SC15JK	SC15HK	5%	4	155
25	SC25JK	SC25HK	2X2.5	6	221
37.5	SC37JK	SC37HK	2X2.5	6	325
50	SC50JK	SC50HK	2X2.5	6	365
75	SC75JK	SC75HK	2X2.5	7	540
100	SC100JK	SC100HK	2X2.5	8	720
150	SC150JK	SC150HK	2X2.5	9	998
167	SC167JK	SC167HK	2X2.5	9	1080
250	SC250JK	SC250HK	2X2.5	9	1370

* For enclosure dimensions refer to table on following page

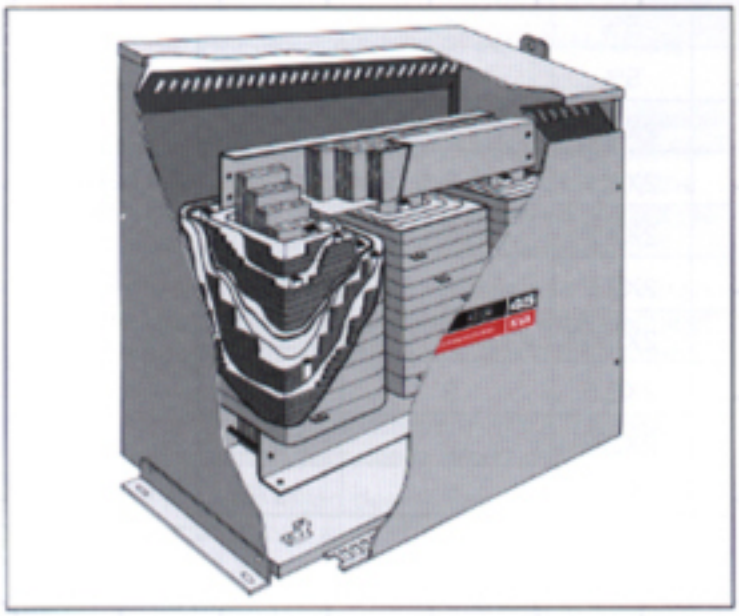
Three phase isolation (double wound) transformers

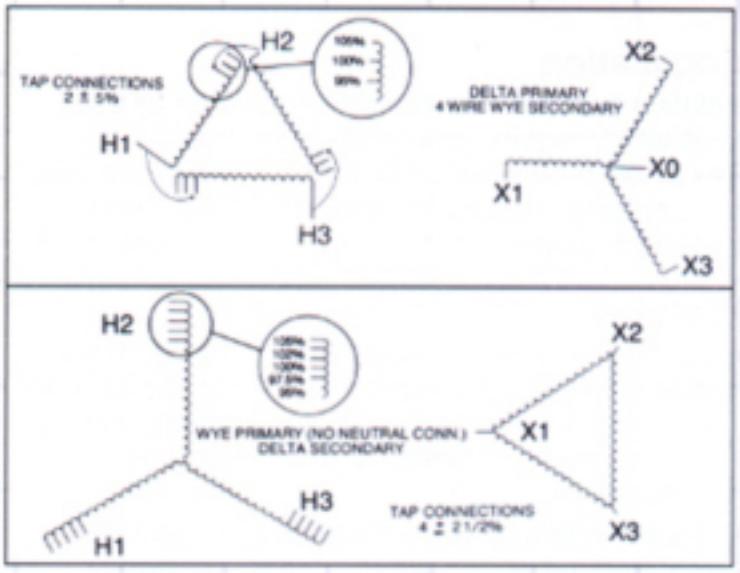
Application

Designed for indoor installation in hotels, schools, factories and industrial and commercial buildings where a reliable power source is required for lighting and other low voltage equipment and machinery

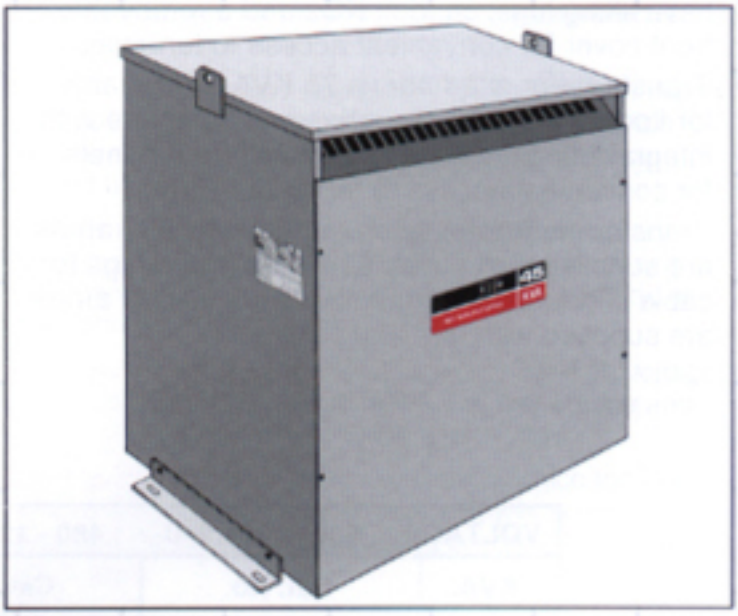
Features

- Using computer aided design techniques and modern materials, Rex engineers have created a range of highly efficient transformers having long trouble-free life with reduced weight, size and cost
- Ventilation openings in the enclosure are coordinated with the cooling ducts in the coils to ensure proper natural circulation of the cooling air for long life and minimum losses
- General purpose ventilated steel enclosure, suitable for indoor locations. After fabrication, they are finished in ASA 61 gray powder coating, suitable for most industrial and commercial installations
- **CSA certified, File No. LR 34493**
- **UL listed, File No. E108255**
- Transformers up to 75 KVA capacity may be readily hung on H-columns, walls, shelves or floor mounted to suit each installation. All units have lifting lugs, conduit KOs and a removable front cover for convenient access to terminals.
- Transformers rated 112.5 - 300 KVA are suitable for floor or platform mounting and complete with integral lifting lugs, and removable top, front and rear panels for convenient access to the terminals.
- Class 220 insulation used throughout range.
- Transformer terminations rated below 330 amps are supplied with suitable hardware and lugs for cable connection. Terminations above 330 amps are supplied with terminal pads only.





TYPICAL ELECTRICAL and TAP CONFIGURATIONS



Enclosure Dimensions

Size No.	Length	Depth	Height
0	9.5	7.00	8.00
1	12.00	9.00	10.00
2	11.00	11.00	14.25
3	15.50	11.00	14.25
4*	15.75	16.00	21.00
5*	20.50	16.00	21.00
6*	20.50	20.75	26.25
7*	24.50	22.00	31.50
8	30.75	27.75	30.75
9	40.00	31.00	44.00
10	46.00	40.00	62.00

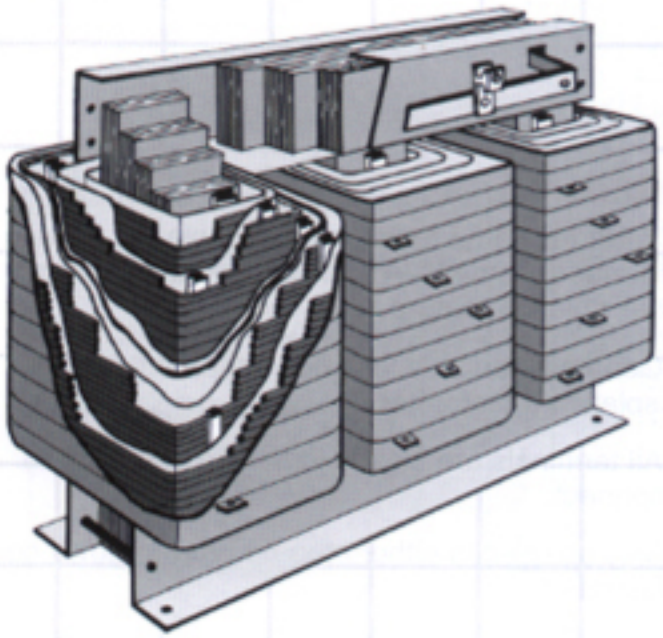
* New Dimensions

Three phase isolation (double wound) transformers

Taps
0 - No Taps
1 - ± 5% FC
2 - ± 2.5% FC
± 5% FC

PRI	SEC	KVA	CAT. NO.*	TAPS	HZ	SIZE	lb.	kg.
600 Δ	208 120 Y	3	BC3JM	0	60	3	85	39
		6	BC6JM	1		4	130	59
		9	BC9JM	1		4	143	65
		15	BC15JM	1		5	188	85
		30	BC30JM	2		6	298	124
		45	BC45JM	2		6	360	163
		75	BC75JM	2		7	515	234
		112.5	BC112JM	2		8	780	354
		150	BC150JM	2		8	970	437
		225	BC225JM	2		9	1460	662
		300	BC300JM	2		9	1835	832
480 Δ	208 120 Y	3	BC3HM	0	60	3	85	39
		6	BC6HM	1		4	130	59
		9	BC9HM	1		4	143	65
		15	BC15HM	1		5	188	85
		30	BC30HM	2		6	298	124
		45	BC45HM	2		6	360	163
		75	BC75HM	2		7	515	234
		112.5	BC112HM	2		8	740	333
		150	BC150HM	2		8	970	437
		225	BC225HM	2		9	1460	662
		300	BC300HM	2		9	1835	832
416 Δ	208 120 Y	3	BC3GM	0	60	3	85	39
		6	BC6GM	1		4	130	59
		9	BC9GM	1		4	143	65
		15	BC15GM	1		5	188	85
		30	BC30GM	2		6	298	124
		45	BC45GM	2		6	360	163
		75	BC75GM	2		7	515	234
		112.5	BC112GM	2		8	740	333
		150	BC150GM	2		8	970	437
		225	BC225GM	2		9	1460	662
		300	BC300GM	2		9	1835	832
600 Y	240 Δ	3	BC3QC	0	60	3	85	39
		6	BC6QC	1		4	130	59
		9	BC9QC	1		4	143	65
		15	BC15QC	1		5	188	85
		30	BC30QC	2		6	298	124
		45	BC45QC	2		6	360	163
		75	BC75QC	2		7	515	234
		112.5	BC112QC	2		8	740	333
		150	BC150QC	2		8	970	437
		225	BC225QC	2		9	1460	662
		300	BC300QC	2		9	1835	832

* BC - Copper or
BA - Aluminum
See Catalogue Numbering System



Note:
Rex enclosures number 4, 5, 6, and 7 are standard indoor NEMA 3R sprinkler proof complete with floor & wall mounting hardware included.

For transformers up to 5MVA in size and 35,000 Volts consult the head office

Notes

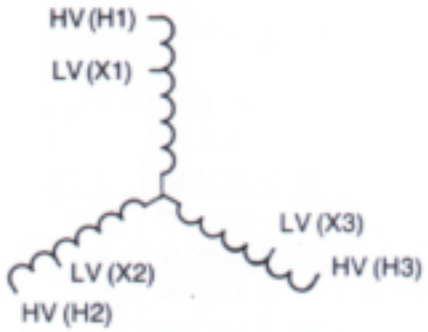
- Other primary and secondary voltages available.
- Refer to factory for other frequencies.
- All enclosures listed are indoor type.
- Outdoor enclosures available, refer to factory.
- All dimensions are subject to change and should not be used for construction purposes. Certified drawings supplied upon request.
- Shipping weights are approximate. Actual weights may be higher due to packing and crating.
- Open type, core and coil transformers available, refer to factory.

Three phase autotransformers

Application

Autotransformers are an economical and compact means of connecting electrical equipment to a power supply of a different voltage. Part of the winding is common to both primary and secondary circuits so there is no isolation between the two. This may not be acceptable on some power systems which do not have a grounded neutral on the secondary side of the main power transformer. Typical applications include motor loads of industrial machinery, electric heating, air conditioners, etc.

TYPICAL ELECTRICAL CONFIGURATION



Features

- Performs same function as an isolation transformer of same KVA and voltage rating without the isolation feature.
- Generally radiates less noise than equivalent isolation transformer
- All terminals are clearly identified and easy to connect
- May be used in either step-up or step-down configuration
- Low regulation; less than three percent
- Class 220 insulation used throughout range
- **CSA certified, File No. LR 34493**
- **UL listed, File No. E108255**
- General purpose ventilated steel enclosure suitable for indoor location. After fabrication all metal is finished in ASA 61 gray powder coating suitable for most industrial and commercial installations.
- Transformers in up to #7 Enclosure may be readily hung on H-columns, walls, shelves or floor mounted to suit each installation. All units have lifting lugs, conduit KOs and a removable front cover for convenient access to terminals.
- Transformers in #8 or larger enclosures are suitable for floor or platform mounting and complete with integral lifting lugs, and removable top, front and rear panels for convenient access to the terminals.
- Transformer terminations rated below 330 amps are supplied with suitable hardware and lugs for cable connection. Terminations above 330 amps are supplied with terminal pads only.

Enclosure Dimensions

Size No.	Length	Depth	Height
0	9.5	7.00	8.00
1	12.00	9.00	10.00
2	11.00	11.00	14.25
3	15.50	11.00	14.25
4*	15.75	16.00	21.00
5*	20.50	16.00	21.00
6*	20.50	20.75	26.25
7*	24.50	22.00	31.50
8	30.75	27.75	30.75
9	40.00	31.00	44.00
10	46.00	40.00	62.00

* New Dimensions

Notes

- Other primary and secondary voltages available.
- Standard units do not have primary taps.
- Taps available on special order, refer to factory.
- Refer to factory for other frequencies.
- All enclosures listed are indoor type.
- Outdoor enclosures available, refer to factory.
- All dimensions are subject to change and should not be used for construction purposes. Certified drawings supplied upon request.
- Shipping weights are approximate. Actual weights may be higher due to packing and crating.
- Open type, core and coil transformers available, refer to factory.

Three phase autotransformers

Taps
0 - No Taps
1 - ± 5% FC
2 - ± 2.5% FC
± 5% FC

H.V.	L.V.	KVA	CAT. NO.	TAPS	HZ	SIZE	lb.	kg.
600Y	480Y	3	RC3JH	0	60	0	21	10
		6	RC6JH			1	34	16
		9	RC9JH			1	45	21
		15	RC15JH			1	65	29
		30	RC30JH			3	115	52
		45	RC45JH			3	135	61
		75	RC75JH			5	200	90
		112.5	RC112JH			6	225	102
		150	RC150JH			6	265	120
		225	RC225JH			7	450	175
		300	RC300JH			7	525	237
600Y	416Y	3	RC3JG	0	60	0	32	15
		6	RC6JG			1	70	32
		9	RC9JG			1	85	39
		15	RC15JG			3	120	54
		30	RC30JG			3	135	61
		45	RC45JG			5	180	81
		75	RC75JG			6	225	102
		112.5	RC112JG			7	300	135
		150	RC150JG			8	400	180
		225	RC225JG			8	540	243
		300	RC300JG			9	615	277
600Y	380Y	3	RC3JF	0	60	1	38	18
		6	RC6JF			1	75	34
		9	RC9JF			3	110	50
		15	RC15JF			3	140	63
		30	RC30JF			5	170	77
		45	RC45JF			5	210	95
		75	RC75JF			6	285	129
		112.5	RC112JF			7	425	192
		150	RC150JF			8	525	237
		225	RC225JF			8	635	286
		300	RC300JF			9	900	405
600Y	240Y	3	RC3JC	0	60	1	40	18
		6	RC6JC			1	75	34
		9	RC9JC			3	120	54
		15	RC15JC			3	155	70
		30	RC30JC			5	225	99
		45	RC45JC			6	265	120
		75	RC75JC			6	400	181
		112.5	RC112JC			7	550	248
		150	RC150JC			7	610	277
		225	RC225JC			8	970	437
		300	RC300JC			9	1300	585

H.V.	L.V.	KVA	CAT. NO.	TAPS	HZ	SIZE	lb.	kg.
600Y	208Y	3	RC3JB	0	60	1	45	21
		6	RC6JB			1	70	32
		9	RC9JB			3	130	59
		15	RC15JB			3	130	59
		30	RC30JB			5	210	95
		45	RC45JB			6	250	113
		75	RC75JB			6	360	163
		112.5	RC112JB			7	555	250
		150	RC150JB			8	650	293
		225	RC225JB			8	920	414
		300	RC300JB			9	1330	599
480Y	240Y	3	RC3HC	0	60	1	65	30
		6	RC6HC			1	85	39
		9	RC9HC			3	110	50
		15	RC15HC			3	125	57
		30	RC30HC			5	200	90
		45	RC45HC			5	225	102
		75	RC75HC			6	325	147
		112.5	RC112HC			7	450	203
		150	RC150HC			7	550	248
		225	RC225HC			8	675	304
		300	RC300HC			8	900	405
480Y	208Y	3	RC3HB	0	60	1	65	30
		6	RC6HB			1	85	39
		9	RC9HB			3	110	50
		15	RC15HB			3	130	59
		30	RC30HB			5	200	90
		45	RC45HB			5	225	102
		75	RC75HB			6	325	147
		112.5	RC112HB			7	450	203
		150	RC150HB			7	550	248
		225	RC225HB			8	675	304
		300	RC300HB			8	900	405
240Y	208Y	3	RC3CB	0	60	0	18	8
		6	RC6CB			0	21	10
		9	RC9CB			1	30	14
		15	RC15CB			1	52	24
		30	RC30CB			3	70	32
		45	RC45CB			3	125	57
		75	RC75CB			5	135	61
		112.5	RC112CB			5	180	81
		150	RC150CB			6	200	90
		225	RC225CB			6	240	108
		300	RC300CB			7	300	135

Encapsulated transformers

Standard dry type ventilated transformers are cooled by circulating the surrounding air through its windings. For trouble free operation and long life expectancy this ventilating air must be reasonably free of dust, moisture or other damaging corrosive fumes. For this reason, standard Dry Type ventilated transformers are normally installed in suitable, indoor locations where they are protected from damaging elements.

Some specifications require installation of transformers in hazardous surroundings where the above mentioned conditions can not be met.

Resin encapsulated transformers are designed for such surroundings.

Typical Applications

Abnormally corrosive, damp or dusty, indoor or outdoor, industrial, commercial and residential, harsh environments, such as:

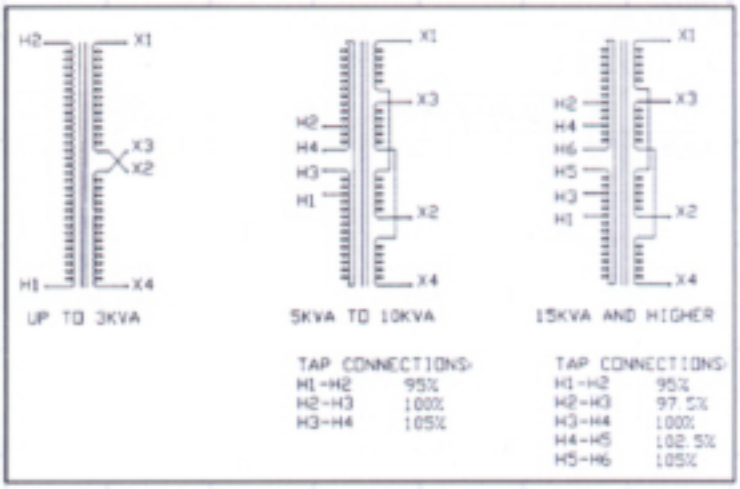
- Corrosive environments: Petro-chemical, steel, pulp and paper industries.
- Damp locations: Mines, pump-houses, underground or rooftop service areas.
- Airborne dust, conductive particles: Textile, woodworking industries.

Resin Encapsulated Type Transformer Construction

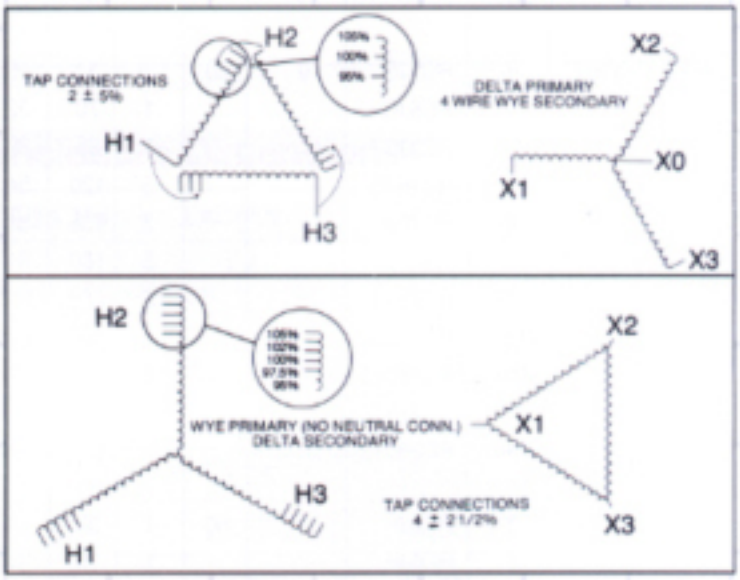
- Mixture of silica sand and resin, forming a solid mass completely encloses and protects the core and coil, also significantly reduces audible noise.
- Windings utilize class 220 C. insulation rated for 150 C. rise, but designed to operate at 115 C. max.
- Core is solidly grounded.
- Enclosure constructed of heavy gauge steel, coated with powder coating, suitable for type 3R, and type 4 applications, indoor or outdoor. Optional stainless steel enclosures are recommended where the enclosure is exposed to severe corrosive environments.
- Wiring compartment, spacious, cool and easily accessible (bottom access for smaller units, front access for large units).

Note

Cat. # in Chart are for 600 volt transformers. For 480 volt see Cat. numbering System Page 1



TYPICAL ELECTRICAL and TAP CONFIGURATIONS



TYPICAL ELECTRICAL and TAP CONFIGURATIONS

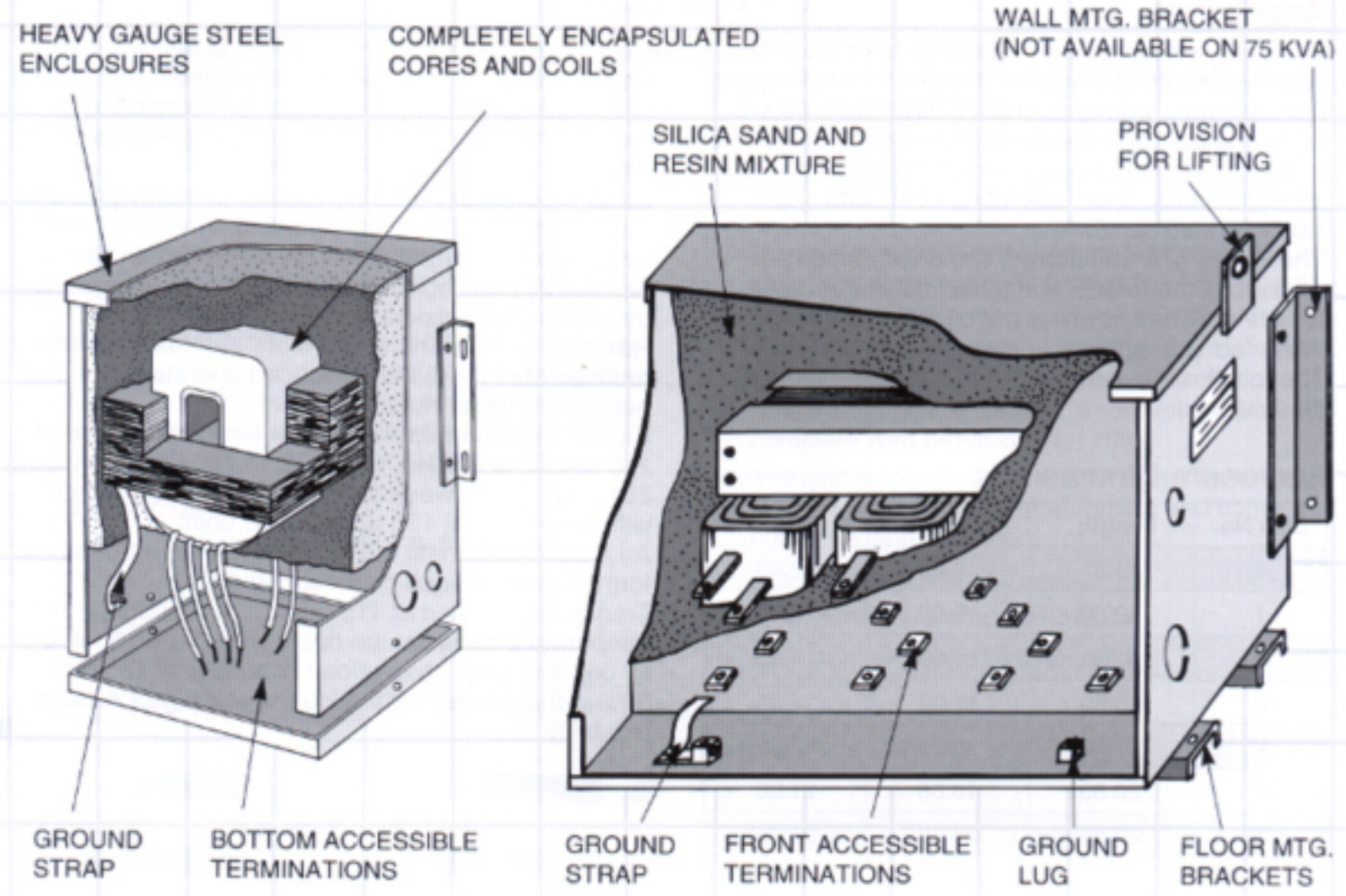
1 Phase Type EP

High Voltage	Low Voltage	KVA	Cat. #	Const. Type	Encl. Size	Weight (lb.)
60 Hz.		1/4	SCO .250JK/EP	1	1E	17
		1/2	SCO .500JK/EP	1	1E	20
		3/4	SCO .750JK/EP	1	1E	23
600	120/240	1.0	SC1JK/EP	1	2E	27
		1.5	SC1.5JK/EP	1	3E	40
	OR	2.0	SC2JK/EP	1	3E	45
		3.0	SC3JK/EP	1	3E	55
		5.0	SC5JK/EP	2	4E	170
480	120/240	7.5	SC7JK/EP	2	4E	180
		10	SC10JK/EP	2	5E	235
		15	SC15JK/EP	2	5E	296
		25	SC25JK/EP	2	6E	355
		37.5	SC37JK/EP	2	6E	395

3 Phase Type EP

High Voltage	Low Voltage	KVA	Cat. #	Const. Type	Encl. Size	Weight (lb.)
60 Hz.		6	BC6JM/EP	2	7	130
		9	BC9JM/EP	2	7	200
600DELTA	208Y/120	15	BC15JM/EP	2	8	415
	OR	30	BC30JM/EP	2	9	536
480DELTA	208Y/120	45	BC45JM/EP	2	9	645
		75	BC75JM/EP	2	10	1300

Encapsulated transformers



CONST. TYPE 1

CONST. TYPE 2

Table of Enclosure Dimensions

Dimensions are in (in.)

Encl. Size	Length	Depth	Height	Cnst. Type
1E	5	4.25	9.75	1
2E	5.875	4.875	10.25	1
3E	7.5	6.125	11	1
4E	9.75	12	16.25	2
5E	15.5	14	19.25	2
6E	15.5	15	25.5	2
7E	15	15	15	2
8E	21	18	17.5	2
9E	21	22	20	2
10E	32	22	25	2

Energy Efficient Transformers (80 Deg. C. and 115 Deg. C. Temperature Rise)

e-Rated™

Application

As energy prices rise it is desirable to reduce the operating costs of electrical systems. Transformers manufactured with temperature rises of 80 deg. C. or 115 deg. C. are designed with lower than normal conductor and total losses which results in greater life expectancy, lower operating costs and significant overload capabilities.

The losses of a transformer are a very small percentage of the total power which flows through it. However all transformers have losses which appear in the form of heat.

The total losses are the sum of the core loss and the load loss

Core loss: losses that are mainly caused by the resistance of the iron core to the magnetic flux magnetizing it. These losses can be reduced by lowering the flux density, using higher grade steel and careful assembly procedures.

Load loss: losses that are caused primarily by the resistance of the winding conductors to the current which flows through them. These losses can be reduced by lowering the resistance of the windings and by lowering the temperature rise of the transformer.

Rex energy efficient transformers are designed with reduced core losses and reduced operating temperatures (Temp. rise).

Each transformer operating at a temperature rise of 115 deg.C. or 80 deg. C. will have approximately 20% and 35% lower losses respectively compared with conventional 150 deg. C. rise units.

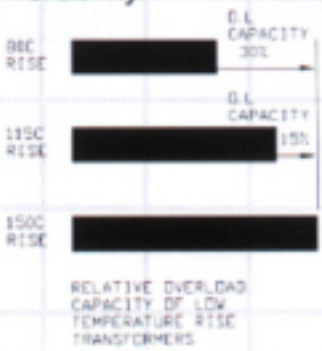
An additional benefit of Rex energy efficient transformers is enhanced overload capability.

Transformers rated at 115 deg. C. or 80 deg. C. temperature rises can be operated at as a 150 deg. C. unit and yield an overload capability of 15% or 30% without reducing the life expectancy or service reliability.

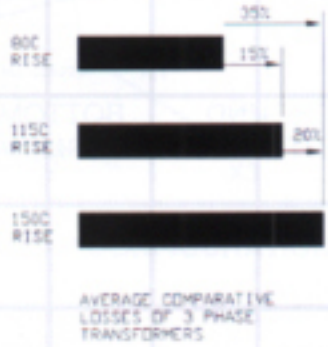
Enclosure Dimensions

* New Dimensions

Size No.	Length	Depth	Height
0	9.5	7.00	8.00
1	12.00	9.00	10.00
2	11.00	11.00	14.25
3	15.50	11.00	14.25
4*	15.75	16.00	21.00
5*	20.50	16.00	21.00
6*	20.50	20.75	26.25
7*	24.50	22.00	31.50
8	30.75	27.75	30.75
9	40.00	31.00	44.00
10	46.00	40.00	62.00



RELATIVE OVERLOAD CAPACITY OF LOW TEMPERATURE RISE TRANSFORMERS



AVERAGE COMPARATIVE LOSSES OF 3 PHASE TRANSFORMERS

TEMPERATURE RISE 115°C VOLTAGE 600 -120Y208					TEMPERATURE RISE 80°C VOLTAGE 600 -120Y208				
KVA	Cat. No.	Taps	Encl. Size	WT.(lb.)	KVA	Cat. No.	Taps	Encl. Size	WT.(lb.)
3	BC3JM/T115	0	4	105	3	BC3JM/T80	0	4	120
6	BC6JM/T115	1	4	135	6	BC6JM/T80	1	4	160
9	BC9JM/T115	1	5	168	9	BC9JM/T80	1	5	185
15	BC15JM/T115	1	6	230	15	BC15JM/T80	1	6	260
30	BC30JM/T115	2	6	290	30	BC30JM/T80	2	7	360
45	BC45JM/T115	2	7	430	45	BC45JM/T80	2	8	500
75	BC75JM/T115	2	8	610	75	BC75JM/T80	2	9	780
112.5	BC112JM/T115	2	9	920	112.5	BC112JM/T80	2	9	1140
150	BC150JM/T115	2	9	1230	150	BC150JM/T80	2	9	1460
225	BC225JM/T115	2	9	1650	225	BC225JM/T80	2	9	1850
300	BC300JM/T115	2	10	2600	300	BC300JM/T80	2	10	2800

Electrostatically Shielded Transformers

Application

Electrostatically (faraday) shielded transformers are designed to protect sensitive electrical and electronic devices and systems from high frequency voltages (electrical noise) or transients that occur due to switching and loading on distribution lines.
Electrical noise and transients are classified two ways.

Normal mode: Noise which appears between the hot & neutral current carrying conductors.

Common mode: Noise which appears between the ground wire and hot and neutral current carrying conductors.

Common mode noise is more prevalent and should be the key criterion for any noise suppression device.

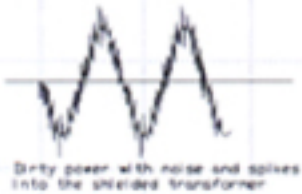
Typical Applications

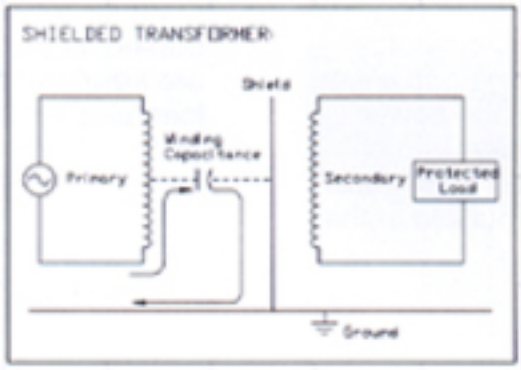
- Hospital operating rooms & X-ray equipment
- Computer installations
- Data processing
- Programmable controllers
- Instrumentation

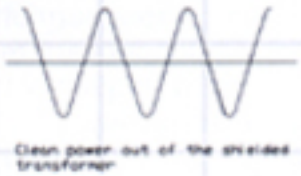
Features

- Shielded transformers are available with copper or aluminum windings
- Knock outs provided for simplified wiring
- Class 220 insulation is used throughout entire range
- General purpose ventilated steel enclosure, suitable for indoor locations finished in ASA 61 powder epoxy paint.
- Transformers rated up to 75 KVA may be readily hung on H columns, walls, shelves or floor mounted to suit each installation. All units come complete with provisions for lifting.
- Transformers rated 112.5 KVA and over are suitable for floor or platform mounting and come complete with provisions for lifting.
- Internal ground lugs
- CSA certified, file no. LR 34493
- UL listed, file no. E108255

Effects of Electrostatic Shielding







The shielded transformer suppresses common mode noise by introducing a grounded shield (copper or aluminum) between its primary and secondary windings. The grounded shield provides a low resistance path to ground by the effect of capacitive coupling which prevents high frequency signals present in the source voltage from reaching the secondary of the transformer and subsequently the connected load.
The electrostatic shield will not perform any function with regard to harmonic current or voltage distortion of waveforms. By redirecting unwanted common mode electrical noise and transients generated on the source side of the transformer to ground the shield is extremely valuable in protecting sensitive equipment connected to the transformer output.

3 Phase Isolation Transformer Common Mode Noise Attenuation		Attenuation Ratio Range
Transformer with no shield:	Minimum attenuation 12 dB Range: 12 dB - 20 dB	10:1
Single Shield:	Minimum attenuation 50 dB Range: 50 dB - 65 dB	1000:1
Double Shield:	Minimum attenuation 65 dB Range: 65 dB - 90 dB	10,000:1
Triple Shield:	Minimum attenuation 90 dB Range: 90 dB - 120 dB	100,000:1
Ultra Isolating:	Minimum attenuation 120 dB Range: 120 dB - 150 dB	1,000,000:1

Several types of electrostatically shielded transformers are available providing the option of various degrees of common mode noise attenuation.

The ratio of the common mode noise attenuation on the input to that of the output is expressed is Decibels (dB).

Isolation transformers with electrostatic shields installed can have input noise to output noise ratios within the range of 10:1 to 1,000,000 or higher.

K - Factor Rated Transformers for Non-Linear Loads

Application

Today's modern electronic, electrical components and circuitry such as computers, copiers, printers, fax machines and display terminals utilize switching mode power supplies for their operation. These switching mode power supplies are non-linear in nature and cause significant power system problems.

- Circuit breakers and fuses blowing far below their current ratings.
- Neutrals in transformers and panelboards are much hotter than their ratings.
- Distribution transformers are overheating even when operating well within their specified nameplate ratings.

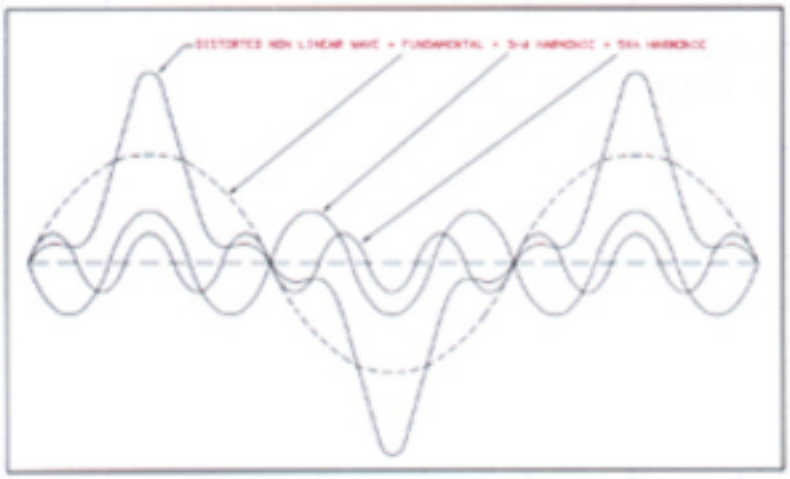
These problems are the result of harmonics. Solid state switching elements such as SCR's, transistors and capacitors which are found in computers, fax machines, solid state drives energy efficient ballasts etc. Continuously switch on an off producing non-linear or non sinusoidal waveshapes in the current supplied from the power source.

A linear load uses current from the power source continuously over the sinusoidal cycle. A non linear load uses current in large pulses from the power source which creates harmonic distortion.
Harmonic components are represented by periodic waves that has a frequency that is a multiple of the fundamental frequency.

Example: fundamental frequency 60 Hz.
3rd harmonic frequency 3 x 60 = 180 Hz.
5th harmonic frequency 5 x 60 = 300 Hz.

Harmonic frequencies superimpose themselves upon the fundamental waveform distorting it and changing its magnitude.

Effects of Harmonic Components on the Sinusoidal Cycle



Effects on Transformers

The major components in the harmonic currents of switching mode power supplies are the third and the fifth harmonics. Harmonics which are even multiples of 3 such as the 3rd, 6th, 9th etc. Are called triplen harmonics. When triplen harmonics are present in a 3 phase system they add together in the neutral conductor. Third harmonics result in a high 180 HZ current flowing through the transformer neutral terminal. The core steel of the transformer has stray losses which will increase dramatically with harmonic distortion. These effects cause the transformers to operate at significantly higher temperatures.

K - Ratings

A K-factor rating applied to a transformer is an index of the transformers ability to supply harmonic content in its load current while operating within it temperature limits.

For dry type transformers a "K-factor" calculation is made to determine the amount of harmonic content present in a power system. K-rated transformers are sized to handle 100% of the fundamental 60 Hz load plus the non-linear load specified. The neutral of the transformer is sized at 200% of the current rating of the phase connections.

Selecting transformer K-rating by load type

K-factor 1:	Motors Incandescent Lighting Resistance Heating Motor Generators (without solid state drives)
K-factor 4:	Hid Lighting Induction Heaters Welders UPS with optional input filtering PLC's and solid state controls
K-factor 13:	Multiple receptacle circuits in health care facilities UPS without input filtering Production or assembly line equipment Facilities and classrooms of schools
K-factor 20:	SCR variable speed drives Circuits with exclusively data processing equip. Main-frame computers Critical care areas and operating rooms of hospitals

Rex Power Magnetics can calculate and supply k-factor ratings of any magnitude when harmonic values are given.

Drive Isolation Transformers (DIT's)

Applications

Rex Power Magnetics drive isolation transformers are specifically designed to meet the requirements of AC and DC variable speed drives or rectifier outputs.

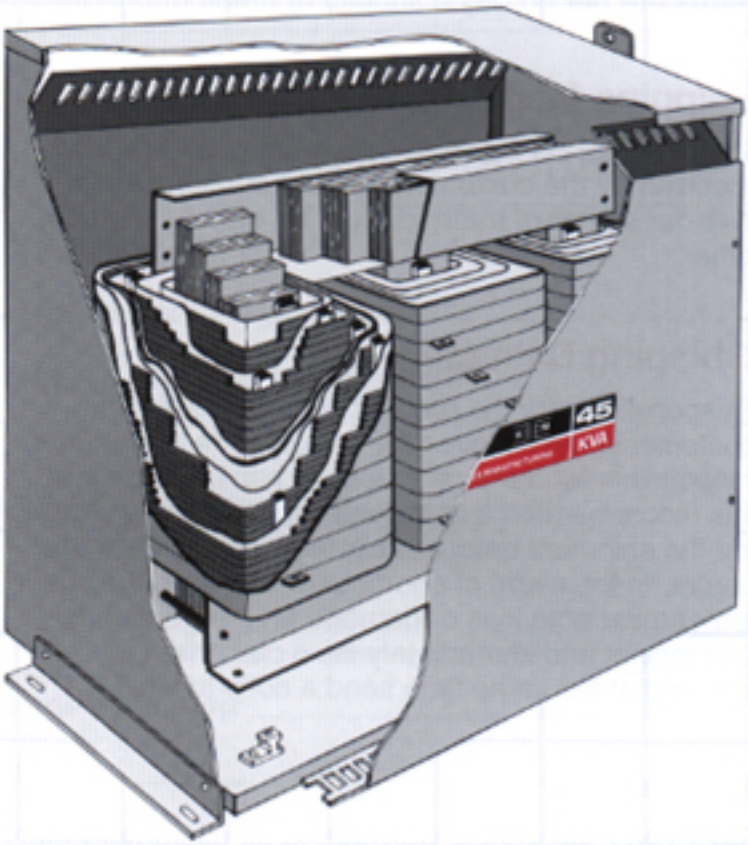
Rex DIT type transformers are manufactured and rated to match standard motor horsepower and voltage ratings.

Features

- Anticipating that harmonics generated by the rectifiers will be present the steel core is increased to operate the transformer at a lower flux density to prevent saturation.
- Standard k-factor 4 rating. All k-factor ratings are available.
- Available in either high quality copper or aluminum windings
- Braced to withstand the mechanical stresses of the current reversals and short circuits associated with SCR drives.
- Isolates the power source from low frequency noise generated by SCR voltage spikes and transient feedback.
- Reduces short circuit currents
- Lower than normal losses and temperature rise for greater life expectancy and overload capability.
- Full current neutral
- Standard taps supplied, ± 5% FCAN & FCBN or ± 2x2 1/2 FCAN & FCBN
- Class 220 insulation is used throughout entire range
- Thermal protectors (thermostats) for overtemperature tripping are supplied standard.
- CSA certified, file number IR 34493
- Ul listed, file number E108255

Standard Voltage Combinations Available

575 DELTA - 575Y332	460 DELTA - 460Y266
575 DELTA - 460Y266	460 DELTA - 230Y133
575 DELTA - 230Y133	230 DELTA - 230Y133



Dimensions and Weight

Drive H.P.	KVA Rating	Encl. Size	WT.(lb.)
5	8	4	135
8	11	4	150
10	14	5	182
15	20	6	247
20	27	6	275
25	34	6	310
30	40	6	336
40	51	7	455
50	63	7	485
60	75	7	565
75	93	8	755
100	118	8	820
125	145	8	890
150	175	9	1250
200	220	9	1470
250	275	9	1750
300	330	9	1990
400	440	10	2700
500	550	10	3100

Enclosure Dimensions

Size No.	Length	Depth	Height
0	9.5	7.00	8.00
1	12.00	9.00	10.00
2	11.00	11.00	14.25
3	15.50	11.00	14.25
4*	15.75	16.00	21.00
5*	20.50	16.00	21.00
6*	20.50	20.75	26.25
7*	24.50	22.00	31.50
8	30.75	27.75	30.75
9	40.00	31.00	44.00
10	46.00	40.00	62.00

* New Dimensions

General Terms

All orders are subject to approval by the Head Office Sales Department. Written quotations are subject to change at any time and are void after 30 days.

Rex Power Magnetics reserves the right to change the design and/or construction of any transformer in any manner in keeping with its policy of constant product improvement.

Terms are net 30 days, subject to credit approval.

Shipping Method

Shipment will be made by any method and routing specified by the customer, but any additional cost over our standard method must be paid by the customer.

Shipping Damage

Responsibility for the product is transferred to the customer when it leaves the factory. The customer is responsible for damage or loss in transit. Therefore it is recommended that the customer carefully examine the shipment before accepting delivery from the carrier. In the event of shortage or damage, the customer must note loss or damage on the transportation receipt and immediately file a claim with the carrier, and at the same time send a copy to Rex.

Warranty

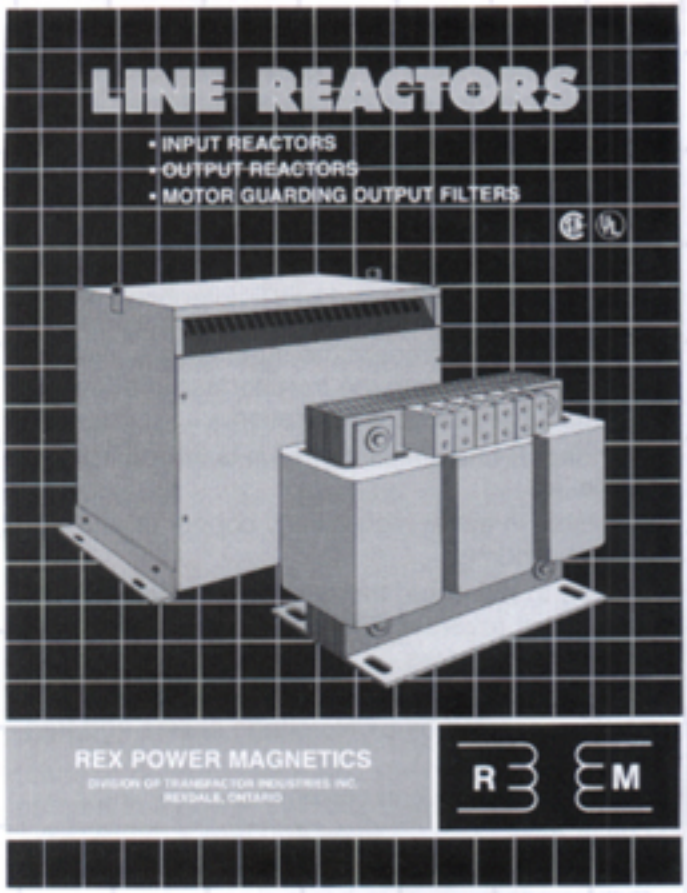
Rex Power Magnetics warrants to its customers that the products delivered conform to the specifications and are free from defects in material and workmanship for a period of one year.

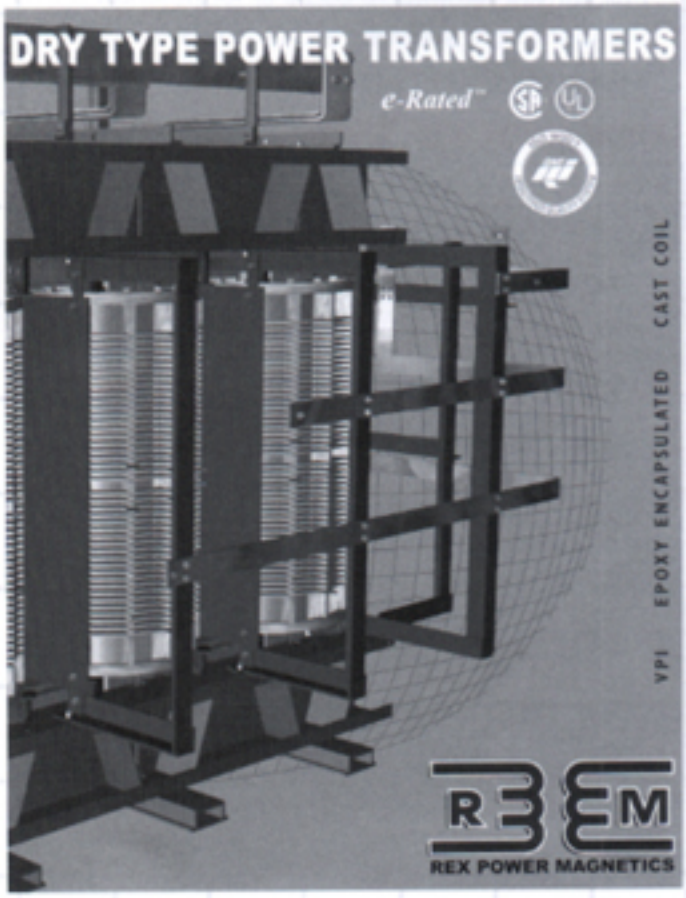
Defects

If any defect in material or workmanship develops within one year from the date of shipment, Rex will (at its opinion) replace or repair the defective part, F.O.B. factory, if (a) Rex has been notified in writing immediately upon the defect coming to light, (b) it has been shipped prepaid to Rex without delay, and (c) the product has not been misused, abused, altered, neglected, improperly installed or damaged.

Limitations

No other warranty is intended or is to be implied. Rex shall not be liable for any indirect damages or damages in excess of the price of the product.





REX POWER MAGNETICS

DIVISION OF TRANSFACTOR INDUSTRIES INC
25 BAYWOOD ROAD, REXDALE, ONTARIO M9V 3Y8
TEL: (416) 747-7818 **FAX:** (416) 747-1956
http://www.rexmanufacturing.com

Date: _____

NAME/LOCATION _____

CONTACT NAME _____

YOUR TEL & FAX # _____

REFERENCE _____

RAPID RESPONSE *'REX TRANSFORMER'* QUOTATION REQUEST

1. QTY. & SIZE _____ KVA (1KVA=1,000VA)
2. PRI. VOLTAGE: _____ [ ] Delta (▲) or [ ] Wye Connected?
3. SEC. VOLTAGE: _____ [ ] Delta (▲) or [ ] Wye Connected?
4. PHASE: [ ] 1-Phase [ ] 3-Phase
5. TYPE: [ ] Auto [ ] Distribution / Isolation [ ] Drive Isolation (K-Rated)
6. WINDINGS [ ] Copper [ ] Aluminum*
7. TEMP. RISE: [ ] 150C [ ] 115C [ ] 80C Other _____
8. ENCLOSURE: [ ] Nema-1 [ ] Nema-2 [ ] Nema-3R Other _____
9. FREQUENCY: [ ] 60Hz [ ] 50/60Hz Other _____
10. Other Information / Specifications: _____

**Aluminum windings may not be available for all items.*

TO CALCULATE 1-PHASE VA: VOLTS X AMPS *EG: 31A x 240 V = 7,440VA (7 1/2 KVA)*
TO CALCULATE 3-PHASE VA: VOLTS X AMPS X 1.732 *EG: 25A x 208 V x 1.732 = 9,007VA (9KVA)*

AUTO TRANSFORMERS - AN ECONOMICAL AND COMPACT MEANS OF CONNECTING ELECTRICAL EQUIPMENT TO A POWER SUPPLY OF A DIFFERENT VOLTAGE. APPLICATIONS INCLUDE MOTOR LOADS, ELECTRICAL HEATING, AIR CONDITIONERS, ETC.

ISOLATION TRANSFORMERS - FOR INSTALLATION IN HOTELS, SCHOOLS, ETC. WHERE A RELIABLE POWER SOURCE IS REQUIRED FOR LIGHTING AND OTHER LOW VOLTAGE EQUIPMENT AND MACHINERY IN COMMERCIAL OR INDUSTRIAL AREAS.

Please feel free to contact us via telephone at 416-747-7818 or 1-800-387-2840

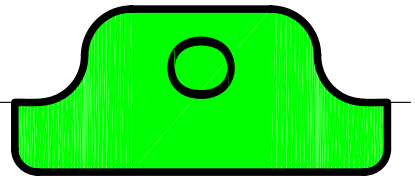
Please Fax To:
REX - INSIDE SALES DEPT.
Fax # 416-747-1956

For Rex Use Only
PRICE: _____
SHIPMENT: _____

Email: sales@RexManufacturing.com

CMFB9903 Rex Quote Pad

FOR FAST QUOTATION RESPONSE PLEASE PHOTOCOPY AND FAX



Submittal Information
Delivered UV Dose Calculations - ODI Aquaray 40 HO VLS
Secondary Effluent

The following calculations are based on the November 2001 BIOASSAY FOR PRIMARY/SECONDARY EFFLUENTS. The data has been linearly scaled (i.e. pilot flow to full-scale flow) within the bioassay report to represent the AQUARAY 40 HO SYSTEM.

System Design Parameters

Flow Rate (MGD)	Q=	4.63
Number of Channels	Nc=	1
Number of Modules Across	Nm=	1
Number of Banks in Series	B=	2
UV Transmittance (%)	UVT=	65
End-of-life Factor	Fp=	0.9
Fouling Factor*	Ft=	1.0
Design Dose (mJ/cm2)	Ddose=	30.0

Actual Dose	Dose=	30,125	uWs/cm2	**Design Dose Safely Achieved**
Total Power	P=	13,200	watts (total)	

(*) In addition to 10% loss of transmittance through the Quartz sleeve

Dosage Calculation

Flow per train (Qtrain). One train is defined as being a single row of modules. The total flow is divided equally between each channel and equally between each row of modules in each channel.

$$Q_{train} = \frac{Q}{N_C \cdot N_m}$$ with 1.15 MGD < Qtrain < 8.06 MGD

Qtrain= 4.63 MGD

The delivered dose per bank (D_B) at given UVT for the Aquaray 40 HO System is as follows,

$$D_B = 41.3 \cdot IF \cdot \frac{Fp}{0.8} \cdot \frac{Ft}{1.0} Qtrain \text{ ^ } (-.735) \cdot 1{,}000$$

D_B= 15,063 uWs/cm2

IF is the Intensity Factor calculated from a PSS simulation (UVDIS 3.1) of the Aquaray 10 HO

CHECKED: LC 11/11/11	Aquaray® 40 HO VLS Delivered UV Dose Calculations, Fountain, CO			SHT: 1 of 2
APPROVED: JN 11/11/11	OZONIA NORTH AMERICA 600 WILLOW TREE ROAD LEONIA, NJ 07605	A	DWG No. 18253-77-0036	REV: -

$$IF = \frac{0.0036 \cdot UVT(\%)^2 - 0.2283 \cdot UVT(\%) + 7.4121}{0.0036 \cdot 65^2 - 0.2283 \cdot 65 + 7.4121}$$

IF= 1.000

The total delivered dose is calculated by multiplying the delivered dose per bank (D_B) by the number of banks in series B. The result should be higher or equal to the design dose specified above

Dose= Db*B

Dose= 30,125 uWs/cm2

CHECKED: LC 11/11/11	Aquaray® 40 HO VLS Delivered UV Dose Calculations, Fountain, CO			SHT: 2 of 2
APPROVED: JN 11/11/11	OZONIA NORTH AMERICA 600 WILLOW TREE ROAD LEONIA, NJ 07605	A	DWG No. 18253-77-0036	REV: -

Submittal Information
Headloss Calculations
Aquaray 40 HO UV Disinfection System

The following calculations are based on Denard R&D report 03 002 18 dated August 5, 2003, which developed the headloss calculation based on statistical analysis of empirical data.

Parameters

Flow Rate

Q=	4.63	MGD
	7.16	ft3/sec

Channel Configuration

Nc=	1	(number of channels)
Nm=	1	(number of modules across channel)
B=	2	(number of banks in series)

Calculate mean velocity through module

Vm = (Q x Lr)/(Nc x Nm x Vv)

Lr=	2.083	= length of bank in ft
Vv=	19.05	= void volume of one module in ft3

Vm = 0.78 ft/sec

Calculate headloss through channel

HL (in) = 1.2*Vm (ft/sec)^2 * # of modules in series

HL = 1.47 inches

Checked: LC 11/11/11	Aquaray® 3X HO VLS Head Loss Calculations, Fountain, CO				SHT: 1 of 1
APPROVED: JN 11/11/11	OZONIA	OZONIA NORTH AMERICA 600 WILLOW TREE ROAD LEONIA, NJ 07605	A	DWG No. 18253-77-0037	REV: -