Technical Bulletin: ACCESSORY INFORMATION

Variable Flow (Range) Canopy with Monitor for NU-640 (Series A↑) Class II, Type A2, Biosafety/Animal Handling Cabinets

General

NuAire, Class II, Type A2 (NSF/ANSI 49 North American designation) Biosafety/Animal Handling Cabinet when exhausted outside through a properly functioning canopy, thimble or air gap exhaust transition, may be used for work with volatile chemicals if permitted by a chemical risk assessment.

This is possible, since the cabinet conforms to the following requirements:

1. Maintains a minimum average inflow velocity of 100 LFPM (.51 m/s) through the work access opening
2. Has HEPA filtered downflow air that is mixed with the inflow air from a common exhaust plenum
3. Exhaust airflow can either be room re-circulated or exchanged outside using a canopy exhaust transition
4. Has all biologically contaminated ducts and plenums under negative pressure or surrounded by negative pressure

To further the discussion, NSF/ANSI 49 defines a canopy connected exhaust as the following:

Canopy Connect Exhaust
The external exhaust shall draw air sufficient to capture all exhaust from the BSC and to maintain a flow of air into the exhaust connection through the openings or gaps. The flow of air through the opening or gaps provides a buffer between the BSC exhaust and variation in the external exhaust system assuring consistent BSC performance and/or containment of volatile chemicals used in the BSC. Properly sized canopy openings or gaps also provide enough relief open area, so that if the cabinet exhaust system fails, the BSC will continue to function as if it was not connected to an exhaust system and continue to provide biological and particulate containment only. The canopy connection type of BSC exhaust connection is required for externally vented Class II, Type A1 or A2 BSC's.

Along with the canopy connections, an exhaust monitor/alarm is required (provided with canopy) to notify the cabinet user that the canopy is no longer capturing volatiles generated within the cabinet. This requirement is stated in the NSF/ANSI 49 per the following section:

Type A1 or A2 Exhaust Alarm
Type A1 or A2 cabinets may be connected to an exhaust system via a canopy connection and exhausted by a remote fan. Once the cabinet and canopy is set or certified in its acceptable airflow range, audible and visual alarms shall be required to indicate a loss of capture of room air at the canopy air intake(s). The cabinet fan(s) must remain in operation when the alarm is activated.

To meet the above requirements, NuAire offers a Variable Exhaust Flow Canopy that will capture the exhaust efflux from a Class II, Type A2, BSC when properly connected to a plant exhaust system.

To accomplish this objective, the transition must provide pressure conditions similar to that under which the BSC was certified to meet its stated performance. This condition is one in which the air pressure above the exhaust HEPA filter is nearly ambient so that the pressure drop over the exhaust HEPA is consistent from factory test conditions to operational conditions. This demands proper exhaust CFM and static pressure conditions within the exhaust transition from the plant exhaust system. As an added precaution, the plant exhaust fan should be located external to the building so that the entire plant duct system is always at a vacuum (negative pressure) relative to the building.

The canopy exhaust alarm must be tested during each cabinet certification interval, and no less than once a year. NuAire has provided an internal damper (located at the top of the collar of the canopy) that is used to actuate the exhaust alarm. Rotating the handle of this damper clockwise will restrict airflow through the canopy and simulate a loss of exhaust air.

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CANOPY EXHAUST TRANSITIONS

Canopy Transitions, sometimes referred to as a thimble or air gap exhaust transitions, provide an air gap between the exhaust efflux of the BSC and the transition. The air gap essentially insulates the BSC from potential variations of airflow in the facility exhaust system, particularly if multiple BSC's are connected to the same exhaust blower system. NuAire's VFC employs adjustable slide plates to vary slot height corresponding to the amount of room exhaust volume desired. Slot velocity being always negative or drawing into the exhaust duct should range between 150 fpm (.76 mps) to 550 fpm (2.8 mps) as measured in the center of the slot. Upon canopy low flow or loss of exhaust, the integrated airflow monitor will provide both an audible and visual alarm, and then energize a DC solenoid to open the front panel allowing the BSC inflow to be maintained at NSF recommended inflow velocities. The characteristics of Canopy Transitions are as follows:

- Preserves airflow balance within the BSC in a simple dependable manner.
- Has a front service panel to permit exhaust HEPA filter integrity checks.
- Simplifies exhaust system design.
- Provides the adjustability for the amount of laboratory air exhausted whether more for general exhaust or to limit the loss of conditioned air for greater energy efficiency.
- Integrated audible and visual low exhaust alarm.
- Provides a safety operational tolerance range for normal exhaust system fluctuations.

NuAire offers a Variable Flow Canopy to meet most installation requirements.

NU-921
The NU-921 offers an air gap exhaust volume range from 25 to 250 cfm (43 to 425 cmh) with a corresponding exhaust static requirement of .05 to .20" w.g. (1.3 to 5.0 mm w.g.)

VFC INTEGRATION INTO THE LABORATORY MECHANICAL DESIGN

Traditionally, exhaust canopies using a fixed slot area provided a fixed exhaust volume requirement that was added to the cabinet exhaust volume for the total exhaust volume requirement used for the laboratory mechanical design. However, now the VFC has variable slot areas, so the exhaust requirement that is added to the cabinet exhaust volume for the total exhaust volume requirement is also variable for the laboratory mechanical design.

With the VFC offering a range of exhaust volume possibilities, the question becomes, what exhaust volume should be designed into the laboratory mechanical system? Traditionally, exhaust canopies were designed to exhaust approximately 25% more air volume than the cabinets exhaust volume. The VFC now can be used with as little as 5% more or up to 100% more in some cases depending upon cabinet size. The answer to the above question becomes one of what produces the optimal mechanical design. Laboratory size, pressure, air change rate, heat load and other exhausting devices can all have an impact on the designed exhaust volume of the VFC.

If it is found that there is not a specific exhaust requirement, then it is suggested to use a target canopy air volume (i.e., 100 cfm plus cabinet exhaust volume) that offers the ability for on-site adjustment (slot area on canopy) for optimal capture velocity (i.e., 200 fpm). If energy efficiency is desired, then use the minimum canopy air volume.

The real benefit of the VFC is the adjustability both through the design and installation phases. It will provide the mechanical designer flexibility to specify to the optimal exhaust flow volume for the application. It will also let the installer/certifier field adjust to assure the proper capture slot velocity.

If a damper is to be installed directly above the transition, then the internal canopy damper assembly must be removed before the transition is installed on top of the biosafety cabinet. Please reference STB0352 for this procedure.

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Performance Specifications

To apply the VFC to a BSC and design the exhaust properly, additional information required is provided in table 1.
The tables are expressed in nominal values meaning where the systems should be set up to run.
However, due to field variables, NuAire suggests sizing the exhaust systems with excess capability.
A 5% increase over the nominal volume and static pressure requirements will ensure a properly operating system.

TABLE 1
NU-921 Exhaust Flow Volume

NuAire BSC Model	Work Access Opening Inches (mm)	Nominal Inflow CFM 105 FPM CMH (.53 m/s)	Air Gap CFM (CMH) (* 1-1/2" min. gap size)	Total Nominal Volume Range CFM (CMH)
NU-640-400	14 (356)	475 (807)	*100 to 250 (170 to 425)	575 to 725 (977 to 1232)
NU-640-500	14 (356)	579 (984)	*120 to 250 (204 to 425)	699 to 829 (1188 to 1408)
NU-640-600	14 (356)	720 (1223)	*160 to 250 (272 to 425)	880 to 970 (1495 to 1648)

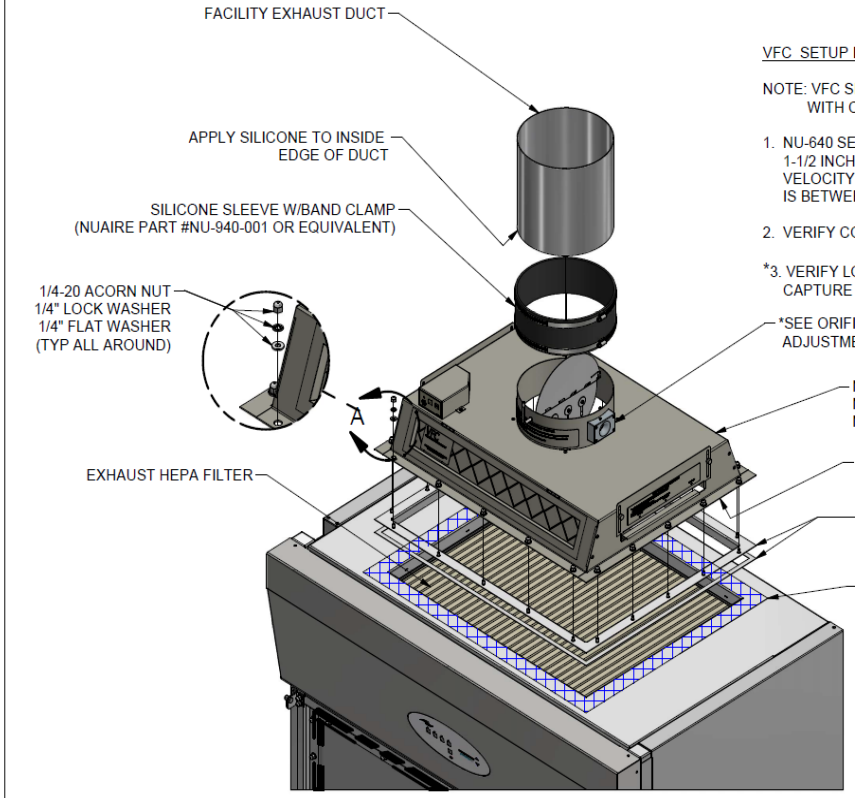
NuAire Variable Flow Canopies for models NU-640

NuAire Variable Flow Canopy (VFC) (Transition Height 5 inches / Collar Height 3-1/2 inches)

Cabinet Width	Collar Diameter	Part Number
4 ft.	10 Inches	NU-921-606**
5 ft.	10 Inches	NU-921-706**
6 ft.	10 Inches	NU-921-806**

**Add the Suffix "E" for 230VAC

REV	ECO	DESCRIPTION	DATE	DFTM	CHKD
A	000620	RELEASED TO PRODUCTION	12/16/2020	LS	MSS



VFC SETUP INSTRUCTIONS:

NOTE: VFC SETUP ADJUSTMENT SHOULD BE MADE WITH CABINET SET AT NOMINAL AIRFLOWS.

1. NU-640 SERIES CABINETS SHALL HAVE A MINIMUM 1-1/2 INCH GAP ON THE SLIDE PLATES. DESIRED AVERAGE VELOCITY MEASURED IN THE CENTER OF THE (3) TEST POINTS IS BETWEEN 325fpm(1.7mps) AND 550fpm(2.8mps).
2. VERIFY CONTAINMENT WITH THE CAPTURE OF SMOKE.
*3. VERIFY LOW EXHAUST ALARM WITH LOSS OF SMOKE CAPTURE WITH IN 15 SECONDS.

VFC INSTALLATION INSTRUCTIONS:

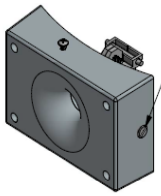
1. CLEAN SURFACE ON THE TOP OF THE CABINET WHERE THE TRANSITION ATTACHMENT FRAME IS GOING TO BE INSTALLED. (APPROX. 1-1/4" ALL AROUND FILTER AREA).
2. REMOVE BACKING FROM THE VHB TAPE ON BOTTOM OF TRANSITION ATTACHMENT FRAME LAY FRAME OVER EXHAUST HEPA AREA ON TOP OF THE CABINET AND APPLY EVEN PRESSURE TO FRAME TO ASSURE FULL CONTACT OF VHB TAPE.
3. PLACE TRANSITION ON ATTACHMENT FRAME AND FASTEN WITH HARDWARE PROVIDED.
4. ATTACH EXHAUST DUCT TO TRANSITION.

5a. CONNECT EXISTING DUCT WORK TO THE TRANSITION USING SILICONE SLEEVE.
WRAP THE SLEEVE AROUND THE VALVE AND DUCT EXTENDING THE SLEEVE A MINIMUM OF 1" [25mm].
OVERLAP THE SLEEVE A MINIMUM OF 1" [25mm] AND REMOVE REMAINING SLEEVE MATERIAL.
GLUE THE OVERLAPPED SEAM WITH SILICONE SEALANT PROVIDED.
USING THE BAND CLAMPS, CLAMP SLEEVE INTO PLACE TO ASSURE A TIGHT SEAL.

5b. APPLY 1/4" BEAD OF SILICONE SEALANT AROUND THE INSIDE EDGE OF EXHAUST DUCT.

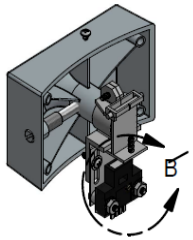
6. PRESS FIT EXHAUST DUCT ONTO TRANSITION RING. ADDITIONAL USE OF DUCT TAPE MAY BE REQUIRED DEPENDING UPON TRANSITION.

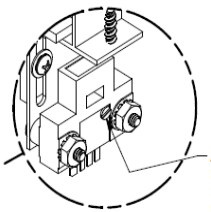
CAUTION: DO NOT DRILL OR USE MECHANICAL FASTNERS THAT WILL DROP METAL PARTICLES UPON THE HEPA FILTER JUST BELOW THE ATTACHMENT AREA.



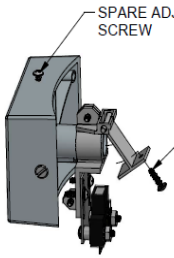
MINOR AIRFLOW ADJUSTMENTS FOR THE EXHAUST ALARM POINT CAN BE MADE USING THE NEEDLE SCREW TO REMOVE OR ADD AIR TO THE SENSOR ORIFICE

ORIFICE / ALARM ADJUSTMENT DETAILS





ALARM SENSITIVITY ADJUSTMENT LOCATED ON THE OPTICAL SENSOR ITSELF IS A SENSITIVITY ADJUSTMENT THAT CAN BE MADE WITH A SMALL BLADE SCREWDRIVER. ADJUST CLOCKWISE FOR MORE SENSITIVITY OR COUNTER CLOCKWISE FOR LESS SENSITIVITY



IT MAY BE NECESSARY TO ADD WEIGHT TO THE AIRFLOW SENSOR FLAP OR TO ROTATE THE SCREW OUT 2-3 TURNS IN ORDER TO DETECT LOSS OF CONTAINMENT AT DIFFERENT EXHAUST VOLUMES

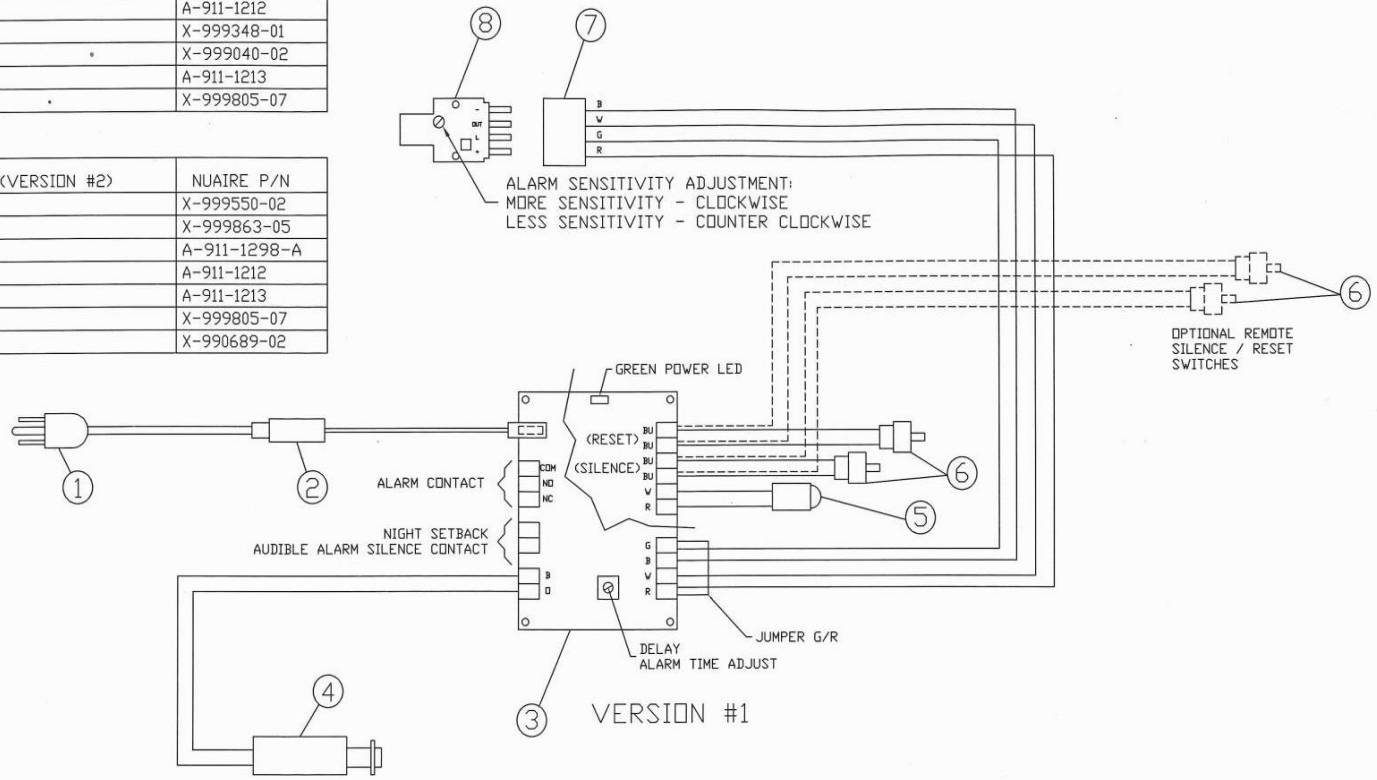
DIFFERENT LENGTH SCREWS(#4-24) ARE SUPPLIED THAT WITH CANOPY THAT CAN BE USED ON THE FLAP TO AID IN SETTING THE EXACT EXHAUST LOSS ALARM PO

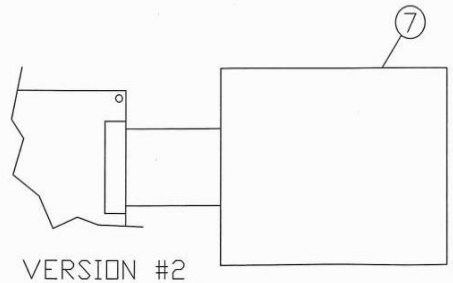
TITLE	NU-640, NU-921 VFC Transition Installation				
DFTM	DATE	CHKD	SHEET	1	OF 1
LS	12/16/2020	MSS			
DRAWING NUMBER	CD-000092				A

REV	ECO	DESCRIPTION	DATE	DRFT	CHKD
D	13451	ADDED VERSION 2	8/3/2017	TH	DSH

ITEM	QTY	DESCRIPTION (VERSION #1)	NUAIRE P/N
1	1	POWER CORD	X-999550-02
2	1	POWER SUPPLY (24VDC)	X-999863-05
3	1	VFC CONTROL BOARD	A-911-1200-A
4	1	SOLENOID	A-911-1212
5	1	LED (RED)	X-999348-01
6	A/R	SWITCH	X-999040-02
7	1	CABLE ASSEMBLY	A-911-1213
8	1	OPTICAL SENSOR	X-999805-07

ITEM	QTY	DESCRIPTION (VERSION #2)	NUAIRE P/N
1	1	POWER CORD	X-999550-02
2	1	POWER SUPPLY (24VDC)	X-999863-05
3	1	VFC CONTROL BOARD	A-911-1298-A
4	1	SOLENOID	A-911-1212
5	1	CABLE ASSEMBLY	A-911-1213
6	1	OPTICAL SENSOR	X-999805-07
7	1	LABEL MEMBRANE	X-990689-02





POWER SPECIFICATIONS
115 VAC, 60 Hz, 1 PHASE, 1 AMP

◯ INDICATES ITEM NUMBER

ORIGINAL

NU-911 / 921 (VFC)
115VAC ELECTRICAL SCHEMATIC

DFTM	LS	5/4/11	CHKD	JH	SHEET 1 OF 1

DRAWING NUMBER BCD-14562 D

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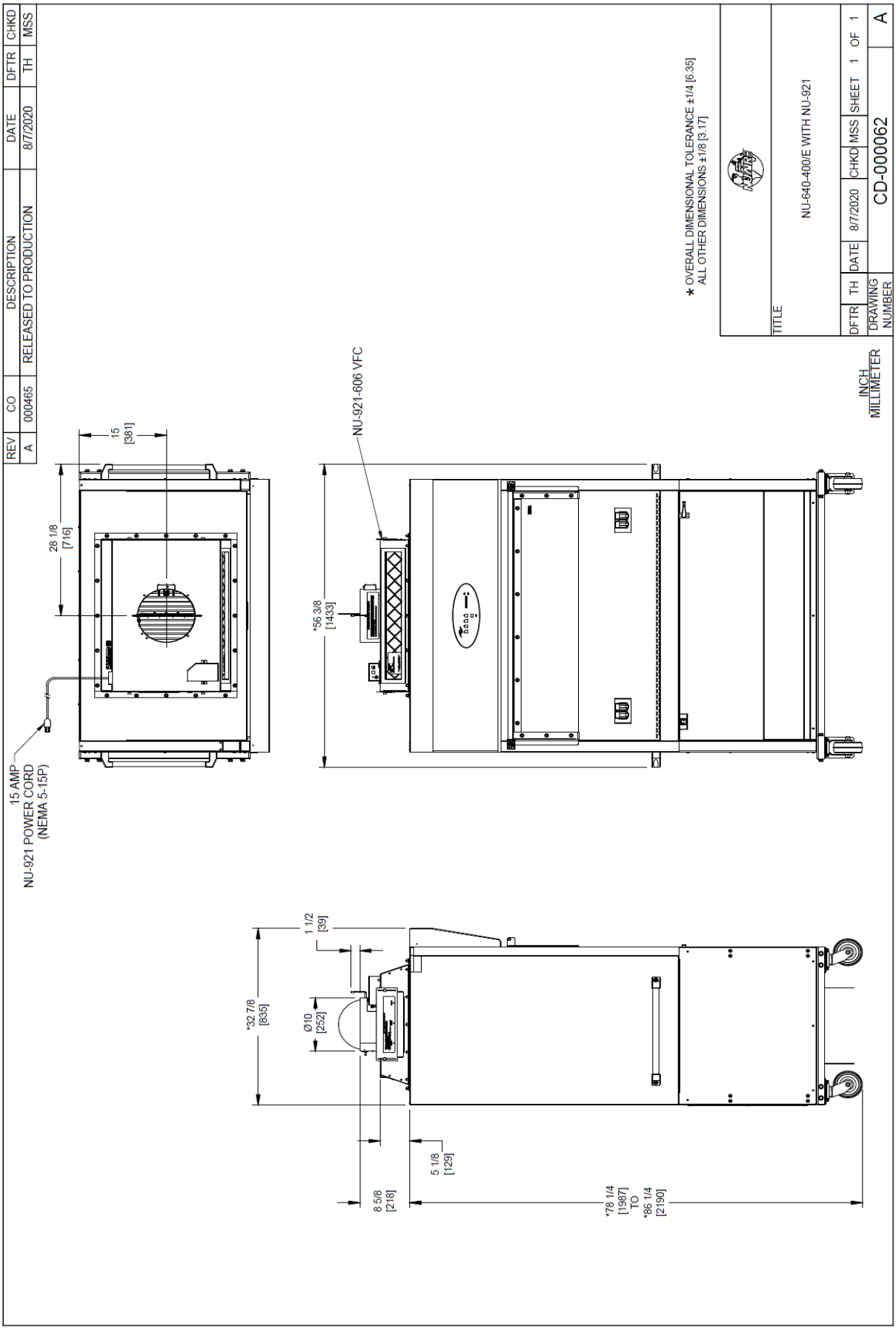

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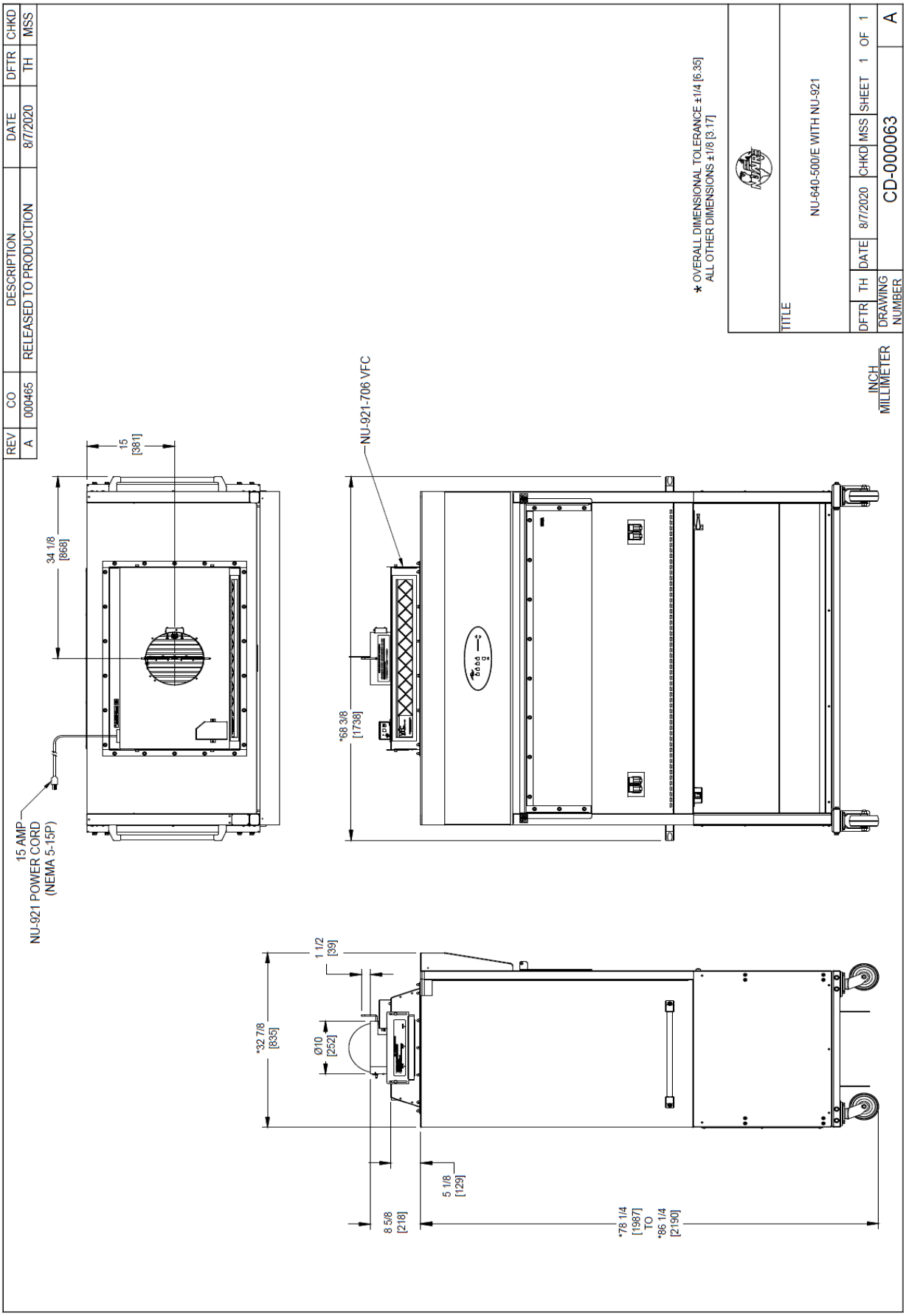

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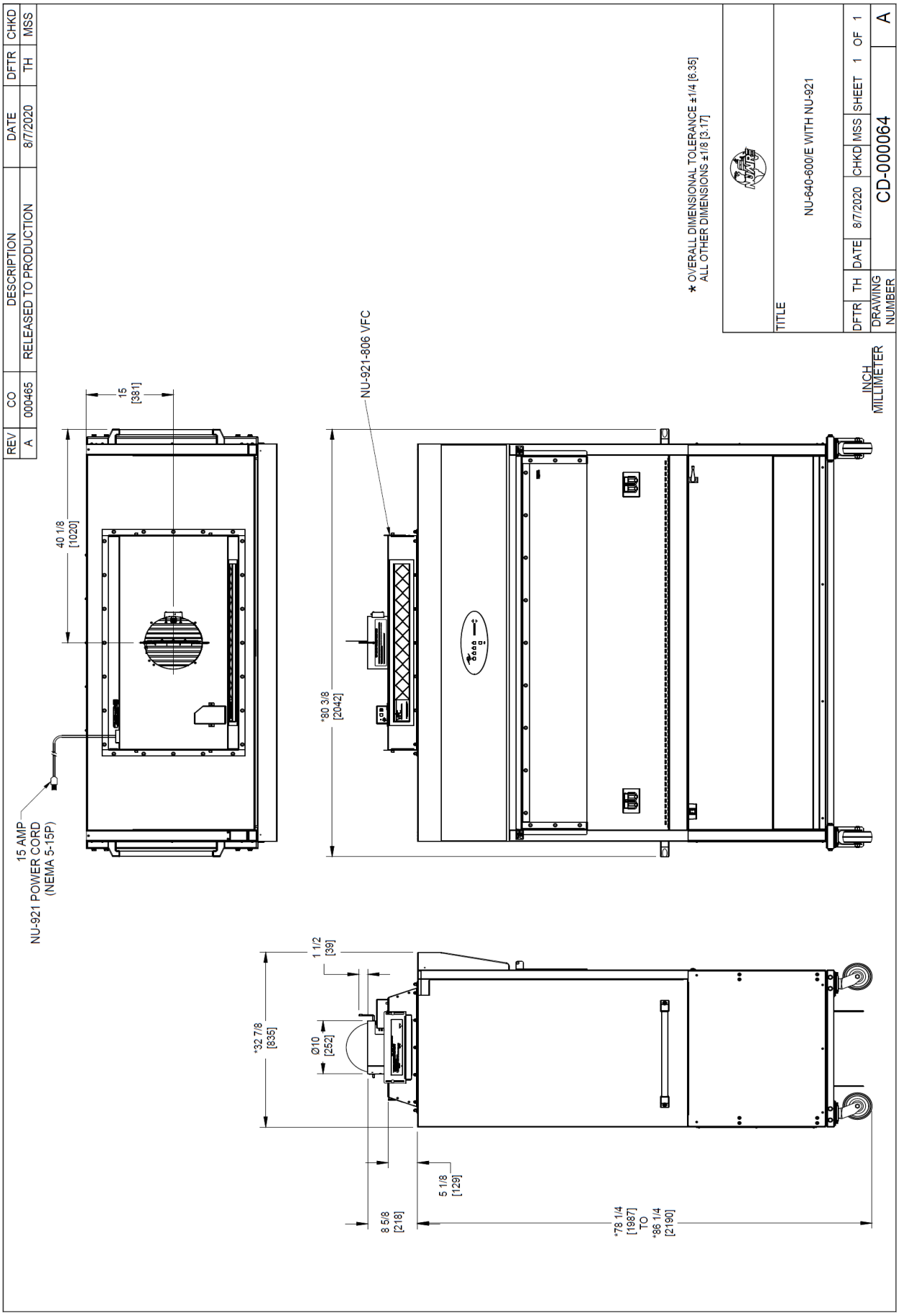

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