



January, 2025

INSTALLATION AND SERVICE MANUAL Floor and Ceiling Mounted Unit Ventilator Models VFV, VFF, VCV, and VCF Models ZFV, ZFF, ZCV, and ZCF







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- Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death, and could cause exposure to substances which have been determined by various state agencies to cause cancer, birth defects or other reproductive harm. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.
- 2. Units with DX evaporator coils (Model Digit 10=5) contain R-454B high pressure refrigerant. Hazards exist that could result in personal injury or death. Installation, maintenance, and service must only be performed by an HVAC technician qualified in R-454B refrigerant and using proper tools and equipment. Due to much higher pressure of R-454B refrigerant, DO NOT USE service equipment or tools designed for refrigerants other than R-454B.

# **AVERTISSEMENT**

- Une installation, un réglage, une altération, une réparation ou une maintenance impropre risque de causer des dommages, des blessures ou la mort, et d'engendrer une exposition à des substances dont certains États ont déterminé qu'elles étaient cancérogènes ou pouvaient causer des malformations à la naissance et des problèmes de reproduction. Lisez bien les instructions d'installation, d'utilisation et de maintenance avant d'installer ou de réparer cet appareil.
- 2. Les unités munies de serpentins évaporateurs DX (reportez-vous à la nomenclature du modèle) contiennent du fluide frigorigène à haute pression R-454B. Des dangers existent qui, s'ils se matérialisent, pourraient entraîner des blessures ou la mort. L'installation, l'entretien et le service ne doivent être effectués que par un technicien de CVC qualifié quant à l'usage du fluide frigorigène R-454B en utilisant les outils et l'équipement appropriés. En raison de la pression beaucoup plus élevée du fluide frigorigène R-454B, N'utilisez PAS des outils ou de l'équipement de service qui ne sont pas conçus spécifiquement pour le R-454B.

# IMPORTANT

- The use of this manual is specifically intended for a qualified installation and service agency. A qualified installation and service agency must perform all installation and service of these appliances.
- Units with DX evaporator coils (Model Digit 10=5) contain the refrigerant R-454B. Review the R-454B Material Safety Data Sheet (MSDS) for hazards and first aid measures.
- 3. Refrigerant charging should only be carried out by an EPA-certified air conditioning contractor.
- For units with DX evaporator coils (Model Digit 10=5), Leak Detection System installed. Unit must be powered except for service.
- Units with DX evaporator coils (Model Digit 10=5) are equipped with electrically powered safety measures. To be effective, the unit must be electrically powered at all times after installation, other than when servicing.
- Units with evaporator coils (Model Digit 10=5) shall only be connected to a condenser designed to operate with R-454B.
- Units with evaporator coils (Model Digit 10=5) is a PARTIAL UNIT AIR CONDITIONER and must only be connected to other units that have been confirmed as complying to the PARTIAL UNIT requirements of Standard UL 60335-2-40/CSA C22.2 or UL 1995/CSA C22.2.

# **IMPORTANT**

- Ce manuel est spécifiquement destiné au personnel d'une entreprise qualifiée d'installation et d'entretien. Toutes les opérations d'installation et d'entretien doivent être confiées à une entreprise qualifiée.
- Les unités munies de serpentins évaporateurs DX (reportez-vous à la nomenclature du modèle) contiennent du fluide frigorigène R-454B. Pour les dangers et les mesures de premiers soins, consultez la fiche signalétique du R-454B.
- L'ajout de frigorigène doit être confié à un spécialiste de la climatisation certifié par l'agence de la protection de l'environnement (EPA) du gouvernement américain.

# IMPORTANT

- Pour les unités avec des bobines d'évaporateur DX (Modèle Digit 10=5), un système de détection de fuite est installé. L'unité doit être alimentée sauf pendant le service.
- Les unités avec des bobines d'évaporateur DX (modèle Digit 10=5) sont équipées de dispositifs de sécurité alimentés électriquement. Pour être efficace, l'unité doit être alimentée électriquement en permanence après l'installation, sauf pendant l'entretien.
- Les unités munies de serpentins d'évaporateur (chiffre de modèle 10=5) ne doivent être reliées qu'à un condenseur conçu pour fonctionner avec le réfrigérant R-454B.
- Les unités avec des bobines d'évaporateur (Modèle Digit 10=5) sont des CLIMATISEURS PARTIELS et doivent uniquement être connectées à d'autres unités qui ont été confirmées comme étant conformes aux exigences des UNITÉS PARTIELLES de la norme UL 60335-2-40/CSA C22.2 ou UL 1995/ CSA C22.2.

### **INSPECTION ON ARRIVAL**

- 1. Inspect unit upon arrival. In case of damage, report it immediately to transportation company and your local factory sales representative.
- 2. Check rating plate on unit to verify that power supply meets available electric power at the point of installation.
- 3. Inspect unit received for conformance with description of product ordered (including specifications where applicable).

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## SPECIAL PRECAUTIONS

### SPECIAL PRECAUTIONS

THE INSTALLATION AND MAINTENANCE INSTRUCTIONS IN THIS MANUAL MUST BE FOLLOWED TO PROVIDE SAFE, EFFICIENT, AND TROUBLE-FREE OPERATION. IN ADDITION, PARTICULAR CARE MUST BE EXERCISED REGARDING THE SPECIAL PRECAUTIONS LISTED BELOW. FAILURE TO PROPERLY ADDRESS THESE CRITICAL AREAS COULD RESULT IN PROPERTY DAMAGE OR LOSS, PERSONAL INJURY, OR DEATH. THESE INSTRUCTIONS ARE SUBJECT TO ANY MORE RESTRICTIVE LOCAL OR NATIONAL CODES.

### HAZARD INTENSITY LEVELS

- 1. DANGER: Indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.
- 2. WARNING: Indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.
- 3. CAUTION: Indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.
- 4. **IMPORTANT:** Indicates a situation which, if not avoided, MAY result in a potential safety concern.

### **PRÉCAUTIONS PARTICULIÈRES**

LES INSTRUCTIONS D'INSTALLATION ET D'ENTRETIEN DE CE MANUEL DOIVENT ÊTRE OBSERVÉES POUR ASSURER UN FONCTIONNEMENT SÉCURITAIRE, EFFICACE ET FIABLE. DE PLUS, LES PRÉCAUTIONS PARTICULIÈRES CI-APRÈS DOIVENT ÊTRE RIGOUREUSEMENT RESPECTÉES. SINON, IL Y AURAIT RISQUE DE DÉGÂTS MATÉRIELS OU DE PERTE, DE BLESSURE PERSONNELLE OU DE MORT D'HOMME. CES INSTRUCTIONS SONT SUJETTES À TOUTE DISPOSITION PLUS RESTRICTIVE DES CODES PROVINCIAL OU NATIONAL.

### **HIÉRARCHIE DES NIVEAUX DE RISQUES**

- DANGER : Indique un danger imminent qui, s'il n'est pas évité, entraînera INÉVITABLEMENT des blessures graves, voire mortelles.
- AVERTISSEMENT: Indique un danger potentiel qui, s'il n'est pas évité, RISQUE d'entraîner des blessures graves, voire mortelles.
- ATTENTION : Indique un danger potentiel qui, s'il n'est pas évité, PEUT entraîner des blessures mineures ou modérées.
- IMPORTANT: Indique une situation qui, si elle se matérialise, PEUT entraîner des risques pour la sécurité des personnes.

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Appliances must not be installed where they may be exposed to potentially explosive or flammable atmosphere.

## **DANGER**

Les appareils ne doivent pas être installés à un endroit où ils risquent d'être exposés à une atmosphère potentiellement explosive ou inflammable.

## WARNING

- 1. Units that are connected to an air duct within the same room that has less than the minimum room size, that room shall be without continuously operating open flames or potential ignition sources such as an electric heater or other hot surfaces. A flame producing device may be installed in the same space if the device is provided with an effective flame arrest.
- Auxiliary devices which may be a potential ignition source with surface temperatures exceeding 1292F (700C) shall not be installed in the duct work or plenums.
- 3. The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance, or an operating electric heater).
- 4. Disconnect power supply before making wiring connections or working on this equipment. Follow all applicable safety procedures to prevent accidental power up. Failure to do so can result in injury or death from electrical shock or moving parts and may cause equipment damage.
- 5. All appliances must be wired strictly in accordance with the wiring diagram furnished with the appliance. Any wiring different from the wiring diagram could result in a hazard to persons and property.
- Any original factory wiring that requires replacement must be replaced with wiring material having a temperature rating of at least 221°F (105°C).
- 7. Ensure that the supply voltage to the appliance, as indicated on the serial plate, is not 5% greater than rated voltage.
- 8. When servicing or repairing this equipment, use only factory-approved service replacement parts. Refer to the rating plate on the appliance for complete appliance model number, serial number, and company address. Any substitution of parts or controls not approved by the factory will be at the owner's risk.
- 9. Do not use a means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.
- 10. Do not pierce or burn any portion of the refrigeration system.
- Do not use open flames for detection of refrigerant leaks. Use only electronic leak detectors or non-chlorinated leak detection fluids.

12. Be aware that refrigerants may not contain an odor.

(SPECIAL PRECAUTIONS continued next page) (PRÉCAUTIONS PARTICULIÈRES suite page suivante)

## SPECIAL PRECAUTIONS

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- Les unités qui sont raccordées à une conduite d'air dans la même pièce dont la taille est inférieure à la taille minimale requise ne doivent pas comporter de flammes ou de sources d'allumage potentielles en fonctionnement continu, telles qu'un radiateur électrique ou d'autres surfaces chaudes. Un dispositif produisant des flammes peut être installé dans le même espace s'il est muni d'un dispositif d'extinction efficace des flammes.
- Les dispositifs auxiliaires qui peuvent être une source d'inflammation potentielle dont la température de surface dépasse 1292F (700C) ne doivent pas être installés dans les conduits ou les plénums.
- L'appareil doit être entreposé dans une pièce sans sources d'inflammation fonctionnant en continu (par exemple : flammes nues, appareil de gaz en fonctionnement ou chauffage électrique en état).
- 4. Débranchez l'alimentation électrique avant d'effectuer des connexions ou de travailler sur l'appareil. Respectez toutes les procédures de sécurité qui s'appliquent pour éviter toute mise en marche accidentelle. Le non-respect de cette directive peut entraîner des blessures ou la mort causées par un choc électrique ou des pièces mobiles, en plus d'endommager l'appareil.
- Tous les appareils doivent être branchés de manière strictement conforme au diagramme fourni. Tout câblage différent de celui du schéma peut créer des risques de dommages matériels ou de blessures.
- Tout câblage usine d'origine exigeant un remplacement doit être remplacé par un câble d'indice thermique nominal de 221 °F (105 °C).
- Assurez-vous que la tension d'alimentation de l'appareil, comme indiqué sur la plaque de série, n'est pas de 5 % supérieure à la tension nominale.
- 8. Pour l'entretien et les réparations de cet appareil, utilisez uniquement des pièces d'origine certifiées. Pour la liste complete des pièces de rechange, consultez Modine Manufacturing Company. Le numéro de modèle complet, le numéro de série et l'adresse du fabricant figurent sur la plaque signalétique fixée à l'appareil. Toute substitution de pièce ou decommande non approuvée par le fabricant sera aux risques du propriétaire.
- N'utilisez pas un moyen d'accélérer le processus de dégivrage ou de nettoyage, autre que ceux recommandés par le fabricant.
- 10. Ne percez ni ne brûlez aucune partie du système de réfrigération.
- N'utilisez pas de flammes nues pour détecter les fuites de réfrigérant. N'utilisez que des détecteurs de fuites électroniques ou des fluides de détection de fuites non chlorés.
- 12. Sachez que les réfrigérants peuvent ne pas contenir d'odeur.

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- 1. Ensure that the supply voltage to the appliance, as indicated on the serial plate, is not 5% less than the rated voltage.
- 2. Units not approved for use in potable water systems.
- Hot water supplied to the hot water heating option must not exceed 200°F (93°C) temperature or 125 PSIG (862 kPa) pressure.
- Do not operate the units with steam pressure greater than 10 PSIG (68.9 kPa) Steam pressure must be 10 PSIG (68.9 kPa) or lower to avoid excessive discharge air temperatures that could cause burns or personal injury.
- Do not overcharge the refrigeration system. This can lead to elevated compressor discharge pressure and possibly flooding the compressor with liquid.
- When servicing the unit, some components may be hot enough to cause pain or injury. Allow time for cooling of hot components before servicing.
- 7. Do not attempt to reuse any mechanical or electrical component which has been wet. Such component must be replaced.

# ATTENTION

- 1. Vérifiez que la tension d'alimentation de l'appareil n'est pas inférieure de plus de 5 % à la tension nominale inscrite sur la plaque de série.
- 2. Ces unités ne sont pas approuvées pour l'usage dans des systèmes à eau potable.
- La température de l'eau chaude alimentée en vertu de l'option de chauffage de l'eau chaude ne doit pas dépasser 200 °F (93 °C) ou une pression de 125 lb/po<sup>2</sup> (862 kPa).
- 4. Ne faites pas fonctionner l'unité lorsque la pression de vapeur est supérieure à 10 lb/po² (68,9 kPa). La pression de vapeur doit être de 10 lb/po² (68,9 kPa) ou moins pour éviter des températures excessives de l'air d'évacuation qui pourraient causer des brûlures ou des blessures.
- Ne surchargez pas le système de réfrigération. Cela peut entraîner une pression d'évacuation élevée du compresseur et possiblement son inondation.
- Durant l'entretien de l'unité, certains composants peuvent être assez chauds pour causer de la douleur ou une blessure. Laissez les composants chauds se refroidir avant de procéder à tout entretien.
- Ne tentez pas de réutiliser un composant mécanique ou électrique qui a été mouillé. Ces composants doivent être remplacés.

(SPECIAL PRECAUTIONS continued next page) (PRÉCAUTIONS PARTICULIÈRES suite page suivante)

## SPECIAL PRECAUTIONS

# MPORTANT

- 1. Start up and adjustment procedures, installation, and service of these appliances must be performed by a qualified installation and service agency.
- 2. No water-flow can cause a freeze condition resulting in damage to the coil.
- 3. Never leave the unit filled with water in a building without heat unless antifreeze has been added.
- 4. All refrigeration checks must be made by a qualified R-454B refrigeration technician.
- 5. Do not release refrigerant to the atmosphere. When adding or removing refrigerant, all national, state/province, and local laws must be followed.
- 6. To check most of the Possible Remedies in the troubleshooting guide listed in *Table 44.1* & *Table 45.1* refer to the applicable sections of the manual.
- Unit performance will be significantly reduced at or above 7215ft (2200m) and should not be operated above this altitude.
- 8. This appliance is not intended to be operated or serviced by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- 9. Children should be supervised to ensure that they do not play with the appliance.

## **IMPORTANT**

- Les procédures de démarrage et de réglage, l'installation et le service de ces appareils doivent être confiés à un centre d'installation et de service qualifié.
- 2. L'absence d'écoulement d'eau risque de causer une condition de gel et d'endommager le serpentin.
- 3. Ne laissez jamais l'appareil rempli d'eau dans un immeuble non chauffé sans lui ajouter de l'antigel.
- Toutes les vérifications de réfrigération doivent être effectuées par un technicien de la réfrigération qualifié en matière de fluide frigorigène R-454B.
- Ne rejetez pas de fluide frigorigène dans l'atmosphère. Respectez toutes les lois locales, provinciales/étatiques et nationales lors de l'ajout ou du retrait de fluide frigorigène.
- Pour essayer la plupart des solutions possibles suggérées dans le guide de dépannage du Tableau 33.1 et Tableau 34.1, reportez-vous aux sections correspondantes du manuel.
- La performance de l'unité sera grandement réduite à une altitude de 7 215 pieds (2 200 m) et elle ne doit pas être utilisée au-delà de cette hauteur.
- 8. Cet appareil n'est pas conçu pour être utilisé ou entretenu par des personnes (y compris des enfants) dont les capacités physiques, sensorielles ou mentales sont réduites, ou qui n'ont pas l'expérience et les connaissances suffisantes, à moins d'être supervisées ou d'avoir obtenu des directives concernant l'utilisation de l'appareil par une personne responsable de leur sécurité.
- Les enfants doivent être supervisés pour s'assurer qu'ils ne jouent pas avec l'appareil.

## UNIT LOCATION

#### Table 6.1 - SI (Metric) Conversion Factors

To Convert	Multiply By	To Obtain	To Convert	Multiply By	To Obtain
"W.C.	0.24	kPa	CFH	1.699	m³/min
psig	6.893	kPa	Btu/ft <sup>3</sup>	0.0374	mJ/m³
°F	(°F-32) x 0.555	°C	pound	0.453	kg
inches	25.4	mm	Btu/hr	0.000293	kW/hr
feet	0.305	meters	gallons	3.785	liters
CFM	0.028	m³/min	psig	27.7	"W.C

### SPECIAL DESIGN REQUESTS

Units are sometimes built units with special features as requested by the customer. This manual only covers standard features and does not include any changes made for special feature requests by the customer. Units built with special features are noted with a 5-digit SPO (Special Product Order) Number on the Serial Plate.

### UNIT LOCATION

## A DANGER

Appliances must not be installed where they may be exposed to potentially explosive or flammable atmosphere.

## 🛦 DANGER

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- 1. Units that are connected to an air duct within the same room that has less than the minimum room size, that room shall be without continuously operating open flames or potential ignition sources such as an electric heater or other hot surfaces. A flame producing device may be installed in the same space if the device is provided with an effective flame arrest.
- Auxiliary devices which may be a potential ignition source with surface temperatures exceeding 1292F (700C) shall not be installed in the duct work or plenums.
- 3. The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance, or an operating electric heater).

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- Les unités qui sont raccordées à une conduite d'air dans la même pièce dont la taille est inférieure à la taille minimale requise ne doivent pas comporter de flammes ou de sources d'allumage potentielles en fonctionnement continu, telles qu'un radiateur électrique ou d'autres surfaces chaudes. Un dispositif produisant des flammes peut être installé dans le même espace s'il est muni d'un dispositif d'extinction efficace des flammes.
- Les dispositifs auxiliaires qui peuvent être une source d'inflammation potentielle dont la température de surface dépasse 1292F (700C) ne doivent pas être installés dans les conduits ou les plénums.
- L'appareil doit être entreposé dans une pièce sans sources d'inflammation fonctionnant en continu (par exemple : flammes nues, appareil de gaz en fonctionnement ou chauffage électrique en état).

## **IMPORTANT**

- 1. Start up and adjustment procedures, installation, and service of these appliances must be performed by a qualified installation and service agency.
- 2. Never leave the unit filled with water in a building without heat unless antifreeze has been added.

## IMPORTANT

- Les procédures de démarrage et de réglage, l'installation et le service de ces appareils doivent être confiés à un centre d'installation et de service qualifié.
- 2. Ne laissez jamais l'appareil rempli d'eau dans un immeuble non chauffé sans lui ajouter de l'antigel.

### HANDLING

Each unit will be shipped to the site secured to a wood skid using metal brackets. Whenever possible, all lifting and handling of the unit should be done with the packing and skid in position. Due to the length of the unit, 72" (1829mm) forklift tines are recommended to avoid damaging the unit.

Remove the metal brackets prior to lifting the unit off of the skid. When slinging or using a forklift to lift the unit, the support points should be sufficiently apart to give stability when lifting. Unless otherwise noted the lifting points should be equidistant from the centerline. Extreme care should be taken not to drop the unit.

Considerable damage can occur to the unit during positioning, in particular, to the paneling and exterior paint. Use an adequate number of personnel and the correct tools when moving the unit. A lifting device such as a forklift is needed to install this product.

A special key is provided with the unit for use with the tamperproof cabinet locks on the top and front panels. The use of torque screwdrivers on panel, cover or component mounting screws is not recommended. Hand-start all screws. If electric drills are used – set at the lowest possible torque.

## UNIT LOCATION

### PREPARATION

- Select the unit location. Ensure the wall or ceiling structure is adequate for the required mounting provisions as outlined in the "INSTALLATION" section. For Ceiling Mounted units (Model Digit 2=C), check that ceiling is capable of supporting the weight of the unit.
- 2. Before installation, ensure that the correct electrical power supplies are available for the unit.
- 3. Each unit requires an independently fused and isolated power supply.
- 4. If the installation has multiple units, check that unit model and tagging corresponds with the installation plans. Please contact your Airedale representative immediately if discrepancies are noted.
- 5. Check to make sure that the units will have adequate clearance around them for servicing. For ceiling units, refer to *Figure 11.1.*
- 6. Note that units with cooling coils will have a condensate connection at the rear and suitable provisions should be made for draining. If multiple units tee into a common drain manifold, it must be sized to ensure free draining with all the units in operation.
- For units with outside air, inspect the wall sleeve installation for gaps that would allow leakage of outdoor air into the space. All joints and abutments should be sealed with waterproof sealant.

### Drainage

Units with cooling coils have a condensate drain pan connection and 3/4" ID condensate line. The condensate drain pan connection is field changeable and can be mounted on either the left or right side of the unit. To change the connection location, remove the condensate line from the elbow. Remove the elbow from the drain pan and remove the plug from the opposite side of the drain pan. Re-install the elbow and the plug on the opposite sides of the drain pan. Re-connect the condensate line.

## MINIMUM ROOM AREA REQUIREMENTS - A2L REFRIGERANT

### **Special Precautions: A2L Refrigerants**

For DX cooling models, due to the slightly flammable nature of R-454B, there are minimum room size requirements by unit size to ensure that if there is a refrigerant leak accumulating in the space, it will not reach a density that can become a risk of ignition. Refer to *Table 8.1* and *Table 9.1* for the lookup tables according to room area. Refrigerant charge maximums, minimum room size, and minimum airflow settings should be followed according to UL 60335-2-40 Annex GG.

Table 8.1 - Refrigerant	Charge	and	Airflow	per	Room
Area - IP Units	•			-	

Floor Mounted (Model Digit 2 = F)			Ceiling Mounted (Model Digit 2 = C)		
A <sub>min</sub> (ft²)	m <sub>max</sub> (lb)	<b>Q</b> <sub>min</sub> (ft³/min)	A <sub>min</sub> (ft²)	m <sub>max</sub> (lb)	<b>Q</b> <sub>min</sub> (ft³/min)
100	2.065	56.3	100	2.710	73.8
110	2.271	61.9	110	2.981	81.2
120	2.478	67.5	120	3.252	88.6
130	2.684	73.1	130	3.523	96.0
140	2.891	78.8	140	3.794	103.3
150	3.097	84.4	150	4.065	110.7
160	3.304	90.0	160	4.336	118.1
170	3.510	95.6	170	4.607	125.5
180	3.717	101.3	180	4.877	132.9
190	3.923	106.9	190	5.148	140.3
200	4.130	112.5	200	5.419	147.6
210	4.336	118.1	210	5.690	155.0
220	4.543	123.8	220	5.961	162.4
230	4.749	129.4	230	6.232	169.8
240	4.956	135.0	240	6.503	177.2
250	5.162	140.6	250	6.774	184.5
260	5.368	146.3	260	7.045	191.9
270	5.575	151.9	270	7.316	199.3
280	5.781	157.5	280	7.587	206.7
290	5.988	163.1	290	7.858	214.1
300	6.194	168.8	300	8.129	221.5
310	6.401	174.4	310	8.400	228.8
320	6.607	180.0	320	8.671	236.2
330	6.814	185.6	330	8.942	243.6
340	7.020	191.3	340	9.213	251.0
350	7.227	196.9	350	9.484	258.4
360	7.433	202.5	360	9.755	265.7
370	7.640	208.1	370	10.026	273.1
380	7.846	213.8	380	10.297	280.5
390	8.053	219.4	390	10.568	287.9
400	8.259	225.0	400	10.839	295.3
410	8.466	230.6	410	11.110	302.7
420	8.672	236.3	420	11.381	310.0
430	8.879	241.9	430	11.652	317.4
440	9.085	247.5	440	11.923	324.8
450	9.292	253.1	450	12.194	332.2

Floor Mounted (Model Digit 2 = F)			Ce (Mo	eiling Mount del Digit 2	ted = C)
A <sub>min</sub> (ft²)	m <sub>max</sub> (lb)	<b>Q</b> <sub>min</sub> (ft³/min)	A <sub>min</sub> (ft²)	m <sub>max</sub> (lb)	<b>Q</b> <sub>min</sub> (ft³/min)
460	9.498	258.8	460	12.465	339.6
470	9.705	264.4	470	12.736	346.9
480	9.911	270.0	480	13.007	354.3
490	10.118	275.6	490	13.278	361.7
500	10.324	281.3	500	13.549	369.1
510	10.531	286.9	510	13.820	376.5
520	10.737	292.5	520	14.091	383.9
530	10.943	298.1	530	14.362	391.2
540	11.150	303.8	540	14.632	398.6
550	11.356	309.4	550	14.903	406.0
560	560 11.563		560	15.174	413.4
570	570 11.769		570	15.445	420.8
580	11.976	326.3	580	15.716	428.1
590	12.182	331.9	590	15.987	435.5
600	12.389	337.5	600	16.258	442.9
610	12.595	343.1	610	16.529	450.3
620	12.802	348.8	620	16.800	457.7
630	13.008	354.4	630	17.071	465.1
640	13.215	360.0	640	17.342	472.4
650	13.421	365.6	650	17.613	479.8
660	13.628	371.3	660	17.884	487.2
670	13.834	376.9	670	18.155	494.6
680	14.041	382.5	680	18.426	502.0
690	14.247	388.1	690	18.697	509.4
700	14.454	393.8	700	18.968	516.7
710	14.660	399.4	710	19.239	524.1
720	14.867	405.0	720	19.510	531.5
730	15.073	410.6	730	19.781	538.9
740	15.280	416.3	740	20.052	546.3
750	15.486	421.9	750	20.323	553.6

1. A<sub>min</sub> = Minimum Room Area

2.  $M_{max}$  = Maximum Refrigerant Charge

3. Q<sub>min</sub> = Minimum Airflow

## **MINIMUM ROOM AREA REQUIREMENTS - A2L REFRIGERANT**

## Table 9.1 - Refrigerant Charge and Airflow per RoomArea - SI Units

Floor Mounted (Model Digit 2 = F)			Ceiling Mounted (Model Digit 2 = C)			
A <sub>min</sub> (m²)	m <sub>max</sub> (kg)	<b>Q</b> <sub>min</sub> (m³/hr)	A <sub>min</sub> (m²)	m <sub>max</sub> (kg)	<b>Q</b> <sub>min</sub> (m³/hr)	
9.290	0.937	95.6	9.290	1.229	125.4	
10.219	1.030	105.1	10.219	1.352	138.0	
11.148	1.124	114.7	11.148	1.475	150.5	
12.077	1.218	124.2	12.077	1.598	163.0	
13.006	1.311	133.8	13.006	1.721	175.6	
13.935	1.405	143.4	13.935	1.844	188.1	
14.864	1.499	152.9	14.864	1.967	200.7	
15.794	1.592	162.5	15.794	2.089	213.2	
16.723	1.686	172.0	16.723	2.212	225.8	
17.652	1.780	181.6	17.652	2.335	238.3	
18.581	1.873	191.1	18.581	2.458	250.8	
19.510	1.967	200.7	19.510	2.581	263.4	
20.439	2.060	210.3	20.439	2.704	275.9	
21.368	2.154	219.8	21.368	2.827	288.5	
22.297	2.248	229.4	22.297	2.950	301.0	
23.226	2.341	238.9	23.226	3.073	313.5	
24.155	2.435	248.5	24.155	3.196	326.1	
25.084	2.529	258.0	25.084	3.319	338.6	
26.013	2.622	267.6	26.013	3.442	351.2	
26.942	2.716	277.2	26.942	3.564	363.7	
27.871	2.810	286.7	27.871	3.687	376.3	
28.800	2.903	296.3	28.800	3.810	388.8	
29.729	2.997	305.8	29.729	3.933	401.3	
30.658	3.091	315.4	30.658	4.056	413.9	
31.587	3.184	324.9	31.587	4.179	426.4	
32.516	3.278	334.5	32.516	4.302	439.0	
33.445	3.372	344.0	33.445	4.425	451.5	
34.374	3.465	353.6	34.374	4.548	464.1	
35.303	3.559	363.2	35.303	4.671	476.6	
36.232	3.653	372.7	36.232	4.794	489.1	
37.161	3.746	382.3	37.161	4.916	501.7	
38.090	3.840	391.8	38.090	5.039	514.2	
39.019	3.934	401.4	39.019	5.162	526.8	
39.948	4.027	410.9	39.948	5.285	539.3	
40.877	4.121	420.5	40.877	5.408	551.8	
41.806	4.215	430.1	41.806	5.531	564.4	
42.735	4.308	439.6	42.735	5.654	576.9	
43.664	4.402	449.2	43.664	5.777	589.5	
44.593	4.496	458.7	44.593	5.900	602.0	
45.522	4.589	468.3	45.522	6.023	614.6	
46.452	4.683	477.8	46.452	6.146	627.1	
47.381	4.777	487.4	47.381	6.268	639.6	
48.310	4.870	497.0	48.310	6.391	652.2	

Floor Mounted (Model Digit 2 = F)			Ce (Mo	iling Mount del Digit 2 :	ed = C)
A <sub>min</sub> (m²)	m <sub>max</sub> (kg)	<b>Q</b> <sub>min</sub> (m³/hr)	A <sub>min</sub> (m²)	m <sub>max</sub> (kg)	<b>Q</b> <sub>min</sub> (m³/hr)
49.239	4.964	506.5	49.239	6.514	664.7
50.168	5.058	516.1	50.168	6.637	677.3
51.097	5.151	525.6	51.097	6.760	689.8
52.026	5.245	535.2	52.026	6.883	702.3
52.955	5.339	544.7	52.955	7.006	714.9
53.884	5.432	554.3	53.884	7.129	727.4
54.813	5.526	563.9	54.813	7.252	740.0
55.742	5.619	573.4	55.742	7.375	752.5
56.671	5.713	583.0	56.671	7.498	765.1
57.600	5.807	592.5	57.600	7.620	777.6
58.529	5.900	602.1	58.529	7.743	790.1
59.458	5.994	611.6	59.458	7.866	802.7
60.387	6.088	621.2	60.387	7.989	815.2
61.316	6.181	630.8	61.316	8.112	827.8
62.245	6.275	640.3	62.245	8.235	840.3
63.174	6.369	649.9	63.174	8.358	852.8
64.103	6.462	659.4	64.103	8.481	865.4
65.032	6.556	669.0	65.032	8.604	877.9
65.961	6.650	678.5	65.961	8.727	890.5
66.890	6.743	688.1	66.890	8.850	903.0
67.819	6.837	697.7	67.819	8.972	915.6
68.748	6.931	707.2	68.748	9.095	928.1
69.677	7.024	716.8	69.677	9.218	940.6

1. A<sub>min</sub> = Minimum Room Area

2.  $M_{max}$  = Maximum Refrigerant Charge

3. Q<sub>min</sub> = Minimum Airflow

### INSTALLATION - FLOOR MOUNTED (MODEL DIGIT 2=F) UNITS

**Note:** (Ceiling Mounted Units proceed to the next section.)

The instructions detailed below are for the Installation of a "Standard" unit. Accommodations and adjustments will be required for the usage of additional unit accessories. Should assistance be required for the installation of these additional items, contact the factory at the phone number listed on the back cover of this manual.

- 1. Check the walls and floor for straightness and check to ensure that the wall is at a right angle to the floor. Should there be any irregularity, the placement of foam tape on the outside edges of the unit will fill the gaps between the unit and the wall, allowing for the use of a sealant, to create a smooth transition from the unit to the wall.
- 2. Remove the backing strip from the gasket on the wall sleeve. Place the unit in the correct location, ensuring a tight seal with the wall sleeve and the wall.
- 3. Place the unit in position and use the leveling legs to ensure that the unit is level in both directions and also plumb. Remove the front kick panel to access the leveling legs (see *Figure 10.1*). Make sure that the foam gasket on the back of the unit forms a tight seal between the unit and the wall.
- 4. After adjusting for any irregularity in the location site, the cabinet must be secured to the back wall. The back of the cabinet has four holes, two on each side. The type of materials used for the walls will determine the type of fastener to use. Use 3/8" (9.5mm) diameter fasteners with 1-1/2" (38.1mm) diameter washers. Securing the cabinet to the wall helps to reduce movement and noise due to vibration. Drill the appropriate sized holes for the fasteners that are to be utilized, and insert the anchors that are to be used.
- 5. Make the condensate drain connection and the electrical connections to the unit. For standard units the condensate connection will be located in the left end compartment when left hand cooling is selected, and in the right end compartment when right hand cooling is selected. For units with a cooling piping package, condensate drain connection will always be located in the right end compartment.

### Figure 10.1 - Leveling Leg Location



### INSTALLATION - CEILING MOUNTED (MODEL DIGIT 2=C) UNITS

The instructions detailed below are for the Installation of a "Standard" unit. Accommodations and adjustments will be required for the usage of additional unit accessories. Should assistance be required for the installation of these additional items, contact the factory at the phone number listed on the back cover of this manual.

- 1. It is recommended that the rear of unit be positioned at least 2" (50.8mm) away from a wall or structure to ensure bottom access panel containing filter and electrical box can fully open.
- 2. Remove both end panels to allow for access to the mounting holes. If installation does not allow for access through the end of the unit, remove bottom panels prior to placing unit on lifting device.
- 3. Place protective material on the supports of the lifting device to prevent scratching or denting of the unit. Place unit on the lifting device supporting the unit across its entire length.
- 4. Raise the unit to the mounting position. Use field supplied rods and fasteners with 1-1/2" (38.1mm) diameter washers to suspend the unit at the mounting holes located at the top of the unit (see *Figure 10.2*). The unit must be suspended at each of the (4) 1" (25.4mm) mounting holes. Do not suspend from any other locations. It is the responsibility of the installer to provide mounting hardware in accordance with local codes and sized appropriately for the given load.
- 5. Install unit level and plumb to prevent excessive vibration and premature failure. To ensure proper drainage unit must be level. Do not mount unit on a slope. Tighten all fasteners.
- 6. Make the condensate drain connection to the unit.

#### Figure 10.2 - Mounting Hole Locations



#### Table 10.1 - Mounting Hole Location Dimension A

Model Size	Dimension A	
750	48.25" (1226mm)	
1000	60.25" (1530mm)	
1250	72.25" (1835mm)	
1500	84.25" (2140mm)	

## INSTALLATION

Figure 11.1 - Recommended Service Clearance for Ceiling Mounted Units



### **Piping Installation - Chilled/Hot Water Coils**

## 

- 1. Units not approved for use in potable water systems.
- Hot water supplied to the hot water heating option must not exceed 200°F (93°C) temperature or 125 PSIG (862 kPa) pressure.
- 3. Do not attempt to reuse any mechanical or electrical component which has been wet. Such component must be replaced.

#### 

- 1. Ces unités ne sont pas approuvées pour l'usage dans des systèmes à eau potable.
- La température de l'eau chaude alimentée en vertu de l'option de chauffage de l'eau chaude ne doit pas dépasser 200 °F (93 °C) ou une pression de 125 lb/po² (862 kPa).
- Ne tentez pas de réutiliser un composant mécanique ou électrique qui a été mouillé. Ces composants doivent être remplacés.

#### Units without Piping Package (Digits 21-22=NN)

- Chilled water and hot water coils are supplied, from the factory, with unions. Field installed piping can be mounted to the supplied unions with 3/4" female sweat connections.
- 2. Install shut-off valves in lines to and from each coil to allow maintenance or replacement of unit without shutting down and draining entire system (see *Figure 11.2* and *Figure 11.3*).
- 3. Include a circuit setter in the return line for water flow regulation.
- A drain valve (hose bib) should also be provided for each coil to allow removal of water from the coil if located in an area subject to freezing.
- 5. It is advisable to use a pipe line strainer before each coil.
- 6. Provide adequate pipe hangers, supports, or anchors to secure the piping system independently of the coil.

7. See *Figure 26.1*, *Figure 26.2*, *Figure 28.1* & *Figure 28.2* for supply and return connections .

#### Units with Piping Package (Digit 21=D or H and 22=D or H)

- Chilled water and hot water piping packages are supplied factory assembled and installed to the coil. All piping packages include the following: control valve, shut-off valves, strainer, circuit setter, PT ports, and balancing valve (when 3-way control valve is selected).
- Piping package terminations are threaded drop ear connections, and are 3/4" for chilled water and 1/2" for hot water. Drop ear connections are attached to fixed plates, and along with the coil provide support for the piping package.
- 3. Piping package termination locations are set such that field piping can be routed through the bottom knock out, back knock out, or out the side of the unit.
- 4. See *Figure 30.1*, *Figure 30.2*, *Figure 32.1* & *Figure 32.2* for supply and return connections.

#### Figure 11.2 - Typical 2-Way Piping Installation



#### Figure 11.3 - Typical 3-Way Piping Installation



### Piping Installation – Direct Expansion (DX) Coils

## IMPORTANT

- Units with DX evaporator coils contain the refrigerant R-454B. Review the R-454B Material Safety Data Sheet (MSDS) for hazards and first aid measures.
- 2. Refrigerant charging should only be carried out by an EPAcertified air conditioning contractor.
- For units with DX evaporator coils (Model Digit 10=5), Leak Detection System installed. Unit must be powered except for service.
- 4. Units with DX evaporator coils (Model Digit 10=5) are equipped with electrically powered safety measures. To be effective, the unit must be electrically powered at all times after installation, other than when servicing.
- Units with evaporator coils (Model Digit 10=5) shall only be connected to a condenser designed to operate with R-454B.
- Units with evaporator coils (Model Digit 10=5) is a PARTIAL UNIT AIR CONDITIONER and must only be connected to other units that have been confirmed as complying to the PARTIAL UNIT requirements of Standard UL 60335-2-40/CSA C22.2 or UL 1995/CSA C22.2.

## **IMPORTANT**

- Les unités munies de serpentins évaporateurs DX (reportez-vous à la nomenclature du modèle) contiennent du fluide frigorigène R-454B. Pour les dangers et les mesures de premiers soins, consultez la fiche signalétique du R-454B.
- L'ajout de frigorigène doit être confié à un spécialiste de la climatisation certifié par l'agence de la protection de l'environnement (EPA) du gouvernement américain.
- Pour les unités avec des bobines d'évaporateur DX (Modèle Digit 10=5), un système de détection de fuite est installé. L'unité doit être alimentée sauf pendant le service.
- 4. Les unités avec des bobines d'évaporateur DX (modèle Digit 10=5) sont équipées de dispositifs de sécurité alimentés électriquement. Pour être efficace, l'unité doit être alimentée électriquement en permanence après l'installation, sauf pendant l'entretien.
- Les unités munies de serpentins d'évaporateur (chiffre de modèle 10=5) ne doivent être reliées qu'à un condenseur conçu pour fonctionner avec le réfrigérant R-454B.
- Les unités avec des bobines d'évaporateur (Modèle Digit 10=5) sont des CLIMATISEURS PARTIELS et doivent uniquement être connectées à d'autres unités qui ont été confirmées comme étant conformes aux exigences des UNITÉS PARTIELLES de la norme UL 60335-2-40/CSA C22.2 ou UL 1995/CSA C22.2.

**Note:** R-454B refrigerant is the only approved refrigerant for this system. The unit should be piped up in accordance with good refrigeration and/or plumbing practices.

See *Figure 27.1* through *Figure 27.2*, for suction and liquid line connections. For units with a heating pipe package, see, *Figure 31.1* through *Figure 31.4*, for suction and liquid line connections.

### **Split Piping Installation**

Pipe-work including piping material, pipe routing, and installation shall include protection from physical damage in operation and service, and be in compliance with national and local codes and standards, such as ASHRAE 15, ASHRAE 15.2, IAPMO Uniform Mechanical Code, ICC International Mechanical Code, or CSA B52. All field joints shall be accessible for inspection prior to being covered or enclosed.

- The outdoor condensing unit must be connected to the indoor unit coil using field supplied refrigerant grade (ACR) copper tubing that is internally clean and dry.
- 2. Units should be installed only with the tubing sizes for the approved system combination as specified in Table 27.1.
- Condensing unit is typically factory charged for a 15-foot (4.6m) lineset. For additional lineset lengths please refer to condensing unit manufacturer's charging chart.
- 4. See the installation and maintenance manual provided with the condensing unit for installation, evacuation and system charge information.
- 5. The field pipework shall be pressure tested with an inert gas and then vacuum tested prior to refrigerant charging, according to the following requirements:
  - a. The minimum test pressure for the low side of the system shall be the low side design pressure and the minimum test pressure for the high side of the system shall be the high side design pressure. If the high side of the system, cannot be isolated from the low side of the system, the entire system shall be pressure tested to the low side design pressure.
  - Field-made refrigerant joints indoors shall be tightness tested. The test method shall have a sensitivity of 5 grams per year of refrigerant or better under a pressure of at least 0.25 times the maximum allowable pressure. No leak shall be detected.

## INSTALLATION

### **Refrigerant Detection System**

#### Introduction

The Modine Refrigerant Detection System (RDS) is an essential safety feature inside unit ventilators that include a refrigerant coil. It helps detect refrigerant leaks and ensures prompt mitigation to prevent hazardous situations. This manual provides detailed instructions for operating and maintaining the RDS.

#### **RDS System Components**

- a. (Qty. 2) Refrigerant leak sensors
- b. (Qty. 1) Alarm Relay This relay will be 2-changeover in models with the Modine Controls System and 4-changeover in DDC-Ready models.

## Function and Operation of the Refrigerant Detection System

The leak sensors are powered and continuously monitoring for the presence of refrigerant whenever the unit is powered. When in a healthy state, these sensors will complete a circuit that will energize the Alarm Relay coil. When the RDS detects leaked refrigerant or one of the sensors fails, the Alarm Relay is de-energized.

The unit ventilator controller, whether Modine Controls or field-installed, will check the status of the Alarm Relay between the numbered terminals 810 and 811. The Modine Controls System will enter an alarm state and execute the sequence of operations described below. In a unit with field-installed controls, electrical interlocks will be used to execute the alarm logic. An spare set of contacts will be available on the Alarm Relay sub-base so that an external monitoring system may look at the relay status directly.

- a. The sensor that detected the refrigerant will show a red LED that is steady on.
- b. A visual alert is given when the unit is equipped with the pAD space temperature sensor.
- c. An alert is given over the BMS when the unit is equipped with a BACnet communication card.
- d. The compressor is stopped.
- e. The supply fan is started and will run continuously.

When a concentration of refrigerant is detected at 12% LFL or greater, the following mitigation actions SHALL be taken when the unit is DDC-Ready:

- a. The sensor that detected the refrigerant will show a red LED that is steady on.
- b. The compressor shall be stopped.
- c. The supply fan shall be started and will run continuously.

Mitigation will continue for at least 5 minutes after the concentration has decreased to a safe level. If the unit is equipped with the Modine Controls System, the alarm must be reset manually via the space sensor, display accessory, or BMS network in order to resume normal operation.

#### **Required Servicing Measures**

To ensure optimal performance and safety, follow these servicing guidelines:

- a. Regularly inspect the RDS sensors for any signs of damage or contamination.
- b. Test the RDS periodically to verify its functionality.

#### Limited Life Refrigerant Sensors

The RDS uses refrigerant sensors that have a predetermined lifespan. When a sensor's service life has ended, the system will respond as if leaked refrigerant is detected and the sensor will have to be replaced. Different LEDs are used to indicate the service life status:

- a. Near End-of-Life: Blinking green and amber LEDs will show.
- b. End-of-Life: A blinking red LED will show.

Only replace sensors with those specified by Airedale/Modine. Using unauthorized sensors may compromise safety.

#### Verifying Actuation of Mitigation Actions

After installing the unit ventilator or replacing a sensor, verify that the RDS correctly triggers mitigation actions during a simulated leak. Follow these steps:

- a. Simulate a refrigerant leak using a safe method.
- b. Observe the RDS to confirm that the mitigation actions described earlier are taken.
- c. Reset the system after testing.

### **Piping Installation - Steam Coils**

## 

Do not operate the units within steam pressure greater than 10 psig (68.9 kPa). Steam pressure must be 10 psig (68.9 kPa) or lower to avoid excessive discharge air temperatures that could cause burns or personal injury.

# **ATTENTION**

Ne faites pas fonctionner l'unité lorsque la pression de vapeur est supérieure à 10 lb/po<sup>2</sup> (68,9 kPa). La pression de vapeur doit être de 10 lb/po<sup>2</sup> (68,9 kPa) ou moins pour éviter des températures excessives de l'air d'évacuation qui pourraient causer des brûlures ou des blessures.

- 1. Steam coils are supplied from the factory with 1" NPT connections
- 2. A steam trap should be provided with a trap of sufficient size and capacity to pass a minimum of two times the normal condensate released by the unit at the minimum differential pressure in the system.
- 3. See *Figure 29.1* and *Figure 29.2* for supply and return connections. For units with a heating pipe package, see *Figure 33.1* and *Figure 33.2* for supply and return connections.

#### **Piping Insulation**

#### Standard Units

Chilled water and condensate pipes should be insulated right up to the coil to prevent condensation which can damage objects located below the piping. Chilled water valves must also be insulated to prevent sweating. Hot water pipes should be insulated to reduce heat loss and to prevent overheating of the end compartment.

## Units with Piping Package (not available on Ceiling Mounted units)

Chilled water piping package will not be insulated except when piping is routed through pipe tunnel. Chilled water piping package shall be positioned over drain pans to catch condensate that forms on piping.

## INSTALLATION

### WIRING

## WARNING

- Disconnect power supply before making wiring connections or working on this equipment. Follow all applicable safety procedures to prevent accidental power up. Failure to do so can result in injury or death from electrical shock or moving parts and may cause equipment damage.
- All appliances must be wired strictly in accordance with the wiring diagram furnished with the appliance. Any wiring different from the wiring diagram could result in a hazard to persons and property.
- 3. Any original factory wiring that requires replacement must be replaced with wiring material having a temperature rating of at least 105°C.
- Ensure that the supply voltage to the appliance, as indicated on the serial plate, is not 5% greater than rated voltage

# **AVERTISSEMENT**

- Débranchez l'alimentation électrique avant d'effectuer des connexions ou de travailler sur l'appareil. Respectez toutes les procédures de sécurité qui s'appliquent pour éviter toute mise en marche accidentelle. Le non-respect de cette directive peut entraîner des blessures ou la mort causées par un choc électrique ou des pièces mobiles, en plus d'endommager l'appareil.
- Tous les appareils doivent être branchés de manière strictement conforme au diagramme fourni. Tout câblage différent de celui du schéma peut créer des risques de dommages matériels ou de blessures.
- Tout câblage usine d'origine exigeant un remplacement doit être remplacé par un câble d'indice thermique nominal de 221 °F (105 °C).
- Assurez-vous que la tension d'alimentation de l'appareil, comme indiqué sur la plaque de série, n'est pas de 5 % supérieure à la tension nominale.

# 

- 1. Ensure that the supply voltage to the appliance, as indicated on the serial plate, is not 5% less than the rated voltage.
- 2. Do not attempt to reuse any mechanical or electrical component which has been wet. Such component must be replaced.

# ATTENTION

- Vérifiez que la tension d'alimentation de l'appareil n'est pas inférieure de plus de 5 % à la tension nominale inscrite sur la plaque de série.
- Ne tentez pas de réutiliser un composant mécanique ou électrique qui a été mouillé. Ces composants doivent être remplacés.
- Installation of wiring must conform with local building codes, or in the absence of local codes, with the National Electric Code ANSI/NFPA 70 - Latest Edition. Unit must be electrically grounded in conformance to this code. In Canada, wiring must comply with CSA C22.1, Part 1,

Electrical Code.

- 2. A wiring diagram is provided with each unit. Refer to this diagram for all wiring connections. Electric wiring and circuit protection must be sized to carry the full load amp draw of the motor, starter and any controls that are used with the unit. Refer to the Model Serial plate for MCA and MOP values for the unit.
- 3. When installing any wiring into the control box, extra cable must be left outside the panel to allow the panel to open fully. Failure to follow these instructions may cause damage to the wiring and/or the unit.
- 4. Control wiring may consist of both 24V analog control wiring and low current digital control signal wiring. To avoid signal interference, the two types should be run in separate conduits. If run in the same conduit, the digital signal wiring should be shielded at one end of the wiring run. Wiring should be twisted, stranded, and shielded communication wire.
- 5. The wire gauge must be sized according to the National Electric Code or CSA code based on amp draw and length of run. Use only copper wire.
- 6. A knockout with strain relief is provided on the electrical box for power wiring. Each unit is supplied with terminal strip for power connection.
- 7. Check the cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

## TERMINAL STRIP CONNECTIONS

The terminal strip connections are designed to clamp down on the wires. To properly connect the wires to the terminal strip:

- 1. Push a small flat-head screwdriver into the square hole on the terminal. Press firmly until the screwdriver hits the back stop and opens the terminal (see *Figure 14.1*).
- 2. Remove approximately 3/8" (9.5mm) of insulation from the end of the wire and push the stripped wire into the oval hole in the terminal.
- 3. Remove the screwdriver. Pull on the wire to make sure that it is securely clamped in the terminal.
- 4. Make sure that the terminal clamp is in contact with bare wire (insulation removed).

### Figure 14.1 - Terminal Strip



## START-UP PROCEDURE

### START-UP PROCEDURE

## **MPORTANT**

- 1. Start up and adjustment procedures, installation, and service of these appliances must be performed by a qualified installation and service agency.
- 2. No water-flow can cause a freeze condition resulting in damage to the coil.
- 3. Never leave the unit filled with water in a building without heat unless antifreeze has been added.

## IMPORTANT

- Les procédures de démarrage et de réglage, l'installation et le service de ces appareils doivent être confiés à un centre d'installation et de service qualifié.
- 2. L'absence d'écoulement d'eau risque de causer une condition de gel et d'endommager le serpentin.
- 3. Ne laissez jamais l'appareil rempli d'eau dans un immeuble non chauffé sans lui ajouter de l'antigel.

**Note:** See Start-Up Sheet examples - Figure 20.1 and Figure 21.1.

### **Pre-start Checks**

- Check that the supply voltage matches the unit supply voltage listed on the Unit Serial Plate. Verify that all wiring is secure and properly protected. Trace circuits to insure that the unit has been wired according to the wiring diagram.
- 2. Check that the unit has no visible damage and that all the components are secure.
- Check that all field electrical and mechanical work has been performed according to all applicable Federal, State, and Local codes.
- 4. Check the supply voltage to the unit is within +/- 5% of the voltage on the unit serial plate.
- 5. Check that the system has been correctly flushed.
- 6. Check for any water leaks.
- The unit and interconnecting piping have been evacuated correctly and the condensing unit service valves are open (DX Cooling units only).
- 8. Check that the plug is installed for the condensate connection that is not being used.
- 9. Check that the motor is secure and the shaft and blower set screws are tight. Rotate the blower shaft by hand.
- 10. Check that the filters have been properly installed.
- **Note:** Steps 11 through 18 are only applicable for DX Cooling Models only (Model Digit 10=5).

Prior to beginning work on systems containing FLAMMABLE REFRIGERANTS, safety checks are necessary to ensure that the risk of ignition is minimized

- 11. Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed.
- 12. All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

- The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. nonsparking, adequately sealed or intrinsically safe.
- 14. If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.
- 15. No person carrying out work in relation to a REFRIGERATING SYSTEM which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.
- 16. Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.
- Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance.
- 18. The following checks shall be applied to installations using FLAMMABLE REFRIGERANTS:
  - a. The actual REFRIGERANT CHARGE is in accordance with the room size within which the refrigerant containing parts are installed. Refer to *Table 8.1* and *Table 9.1*
  - b. The ventilation machinery and outlets are operating adequately and are not obstructed.
  - c. If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant.
  - d. Marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected.
  - e. Refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

## START-UP PROCEDURE

## CHECKS TO ELECTRICAL DEVICES

Connecting to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.

Initial safety checks shall include:

- a. That capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking
- b. That no live electrical components and wiring are exposed while charging, recovering or purging the system
- c. That there is continuity of earth bonding.

### **CHARGING PROCEDURE**

In addition to conventional charging procedures, the following requirements shall be followed.

- 1. Prior to charging the system, it shall be pressure-tested with the appropriate purging gas.
- 2. Use only charging equipment used with R-454B refrigerant to ensure that contamination of different refrigerants does not occur.
- 3. Verify the unit to be charged is labeled for use with R-454B refrigerant.
- 4. Charging hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- 5. Cylinders shall be kept in an appropriate position according to the instructions.
- 6. Ensure that the refrigeration system is grounded prior to charging the system with refrigerant.
- 7. Label the system when charging is complete (if not already).
- 8. Extreme care shall be taken not to overfill the refrigeration system.
- 9. The system shall be leak-tested on completion of charging but prior to commissioning and again prior to leaving the site. Do not use an open flame for refrigerant leak testing.

### UNIT START-UP PROCEDURE

- **Note:** For models with DX Cooling, see the installation and maintenance manual provided with the condensing unit for start-up information.
- 1. (DX Cooling models only) Ensure that the condensing unit start-up procedure has been carried out, as detailed in the condensing unit installation and maintenance manual.
- (DX Cooling models only) The compressor should be isolated by removing the connection at the Y1 terminal on the indoor unit. Main power can now be applied to the indoor and outdoor units. A system electrical check can now be carried out.
- 3. Switch the 3-speed switch to position 1, 2 or 3.
- 4. Switch the disconnect switch to the "ON" position.
- 5. Confirm that the blower motor is rotating in the correct direction and blowing air out of the supply air grill.
- 6. (Units with Chilled Water, Hot Water and Steam coils only) Ensure all valves are open to the unit.

- 7. (Units with Chilled Water and Hot Water only) Check water flow rates and pressure drops and compare to design.
- 8. Check that the dampers are not obstructed and move through their full range of motion.
- 9. During the unit operation, measure and record all the information that is required to complete the Start-Up Sheets that are supplied with the unit. Copy the information onto the Start-Up Sheets (*Figure 20.1 and Figure 21.1.*) in this manual for your records.
- (DX Cooling models only) Shut unit down and disconnect the main power. The compressor signal Y1 (disconnected from the indoor unit in step 2) can now be re-connected and main power applied to the system.
- Verify the Refrigeration Detection System is functioning properly by disconnecting the refrigerant leak sensors. The unit should initiate the mitigation actions noted in the previous "Refrigeration Detection System" section. Once verified, reconnect the sensors.
- **Note:** (DX Cooling models only) The 24V power for the indoor unit control circuit is supplied from a unit factory-installed transformer. When the indoor and outdoor units are supplied from separate main supplies, care must be taken to ensure that the outdoor unit is isolated whenever the indoor unit power is removed. Failure to do so may result in freeze ups and other damage to the unit.

### DETECTION OF FLAMMABLE REFRIGERANTS

- 1. Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.
- 2. The following leak detection methods are deemed acceptable for all refrigerant systems:
  - a. Electronic leak detectors may be used to detect refrigerant leaks but, in the case of FLAMMABLE REFRIGERANTS, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used.
  - b. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed.
  - c. Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.
- 3. Examples of leak detection fluids are:
  - a. Bubble Method.
  - b. Fluorescent method agents.
- 4. If a leak is suspected, all naked flames shall be removed/ extinguished.
- 5. If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak

## **SEQUENCE OF OPERATION**

### **TYPICAL SEQUENCE OF OPERATION**

The supply fan shall run at all times when unit is in occupied mode. When in unoccupied mode, the supply fan shall run only on a call for heating or cooling. The supply fan speed can be adjusted using the standard equipped manual 3-speed switch. If equipped with Modine Control System, the supply fan is programmed to run for 2 minutes (adjustable) after the heating or cooling cycle ends.

### Freeze Stat (Optional)

On units equipped, an adjustable auto-resetting freeze stat is factory set to trip at  $35^{\circ}F(1.7^{\circ}C)$  If the coil temperature reaches the limit and the freeze stat trips, it shall automatically reset when the coil temperature rises  $5^{\circ}F$  above the setpoint. The freeze stat shall be wired so that upon tripping, power is removed from the supply fan, the outside air damper closes, and either the HW valve opens (model digit 3=V) or the face & bypass damper goes to full bypass (model digit 3=F).

# Outside Air and Return Air Dampers (Optional)

The outside air and return air dampers control the mixture of return air and outside air drawn through the unit. Both dampers are linked together and are controlled by an actuator requiring a 2-6VDC proportional signal. At 2V, the dampers are positioned for full return air and no outside air. At 6V, the dampers are positioned for full outside air and no return air. The outside air damper shall open to a minimum position to provide ventilation requirements when the room is occupied. When in heating mode, if the space temperature is more than 4°F from the heating setpoint, the outside air damper shall fully close. The outside air damper shall also be fully closed during unoccupied mode. If the unit is equipped with a CO2 sensor, the outside air damper shall modulate open proportionally to compensate for the CO2 levels in the room.

The dampers can act as economizers for free-cooling. If cooling is required and the outside air temperature is below the economizer outside air lockout temperature ( $60^{\circ}F$  ( $15.6^{\circ}C$ ) recommended) and above  $35^{\circ}F$  ( $1.7^{\circ}C$ ) (adjustable), the outside air damper shall modulate open. On units with a Carel controller, the outside air damper shall fully open when the room temperature is above the setpoint by more than  $1^{\circ}F$  (adjustable). Within  $1^{\circ}F$ , the proportional band adjusts the outside air damper. When the unit is in free-cooling, water valves shall be fully closed, and if equipped, the face & bypass damper should move to full bypass position. The outside air lockout temperature on Carel units is factory set to  $60^{\circ}F$  ( $15.6^{\circ}C$ ) and is adjustable.

### **Chilled Water with Valve Control**

Units with a chilled water coil and non-Carel controls desiring valve control shall use a non-spring return modulating valve operated by either a proportional (2-10VDC) or a tri-state (24VAC) signal. Units with a chilled water coil and Carel controls desiring valve control shall use a modulating valve requiring a tri-state signal. When the room temperature is above the cooling setpoint, the valve shall open proportionally according to the adjustable proportional band. The adjustable proportional band on the Carel controller is set to a default 1°F (example: valve is 50% open when room temperature is 0.5°F from setpoint). The Carel controller will not allow the chilled water valve to open when the outside air temperature is below 55°F (12.8°C).

### Chilled Water with Face & Bypass Control

Units equipped with a chilled water coil and face & bypass control shall modulate the face & bypass damper via a spring return actuator, controlled by a proportional signal (2-5.5V). The face & bypass damper regulates the amount of return air and outside air passing through the chilled water coil. On a call for cooling, the damper shall open to the face of the coil proportionally based on how many degrees the room temperature is from the setpoint. The adjustable proportional band on the Carel controller is set to a default 1°F (example: damper is 50% open when room temperature is 0.5°F from setpoint). When the damper is in full bypass position (2V), all return and outside air bypasses the chilled water coil. When the damper is in full face position (5.5V), all return and outside air passes through the chilled water coil.

### **Direct Expansion (DX) Cooling Control**

When the room temperature is above the cooling setpoint, the compressor will be energized. The compressor will de-energize when the room temperature falls below the cooling setpoint. If the factory installed low limit stat detects indoor evaporator coil temperatures below its set point, the compressor will be disabled.

### Hot Water or Steam with Valve Control

Units with a hot water or steam coil and non-Carel controls and valve control shall use a spring-return, normally open modulating valve operated by a proportional signal (2-10VDC) or a tri-state (24VAC) signal. Units with Carel controls desiring valve control shall use a modulating control valve with a proportional signal. When the room temperature is below the heating setpoint, the valve shall open proportionally according to the adjustable proportional band. The adjustable proportional band on the Carel controller is set to a default 1°F (example: valve is 50% open when room temperature is 0.5°F from setpoint). If for any reason the supply air temperature drops below 55°F (12.8°C) (adjustable), the valve shall modulate open to maintain 55°F (12.8°C).

### Hot Water with Face & Bypass Control

Units equipped with a hot water or steam coil and face & bypass control shall modulate the face & bypass damper via a spring return actuator, controlled by a proportional signal (2-5.5V). The face & bypass damper regulates the amount of return air and outside air passing through the heating coil. On a call for heating, the damper shall open proportionally based on how many degrees the room temperature is from the setpoint. The adjustable proportional band on the Carel controller is set to a default 1°F (example: damper is 50% open when room temperature is 0.5°F from setpoint). When the damper is in full bypass position (2V), all return and outside air bypasses the heating coil. When the damper is in full face position (5.5V), all return and outside air passes through the heating coil. If for any reason the supply air temperature drops below 55°F (12.8°C) (adjustable), the heating valve shall open (if equipped) and the face and bypass damper shall modulate to maintain 55°F (12.8°C).

# Hot Water and Chilled Water (2-Pipe) with Valve Control

Units with valve control to provide heating and cooling on a single water coil (2-pipe system) and not using Carel controls shall use a spring-return, normally open modulating valve operated by a proportional signal (2-10VDC) or a tri-state (24VAC) signal. Units with Carel controls shall use a modulating control valve with a proportional signal. On a call for heating or cooling (depending on the season), the valve shall open proportionally based on how many degrees the room temperature is from the setpoint. The adjustable proportional band on the Carel controller is set to a default 1°F (example: valve is 50% open when room temperature is 0.5°F from setpoint). If for any reason the supply air temperature drops below 55°F (12.8°C) (adjustable), the water valve shall modulate open to maintain 55°F (12.8°C). On 2-pipe units not having Carel controls or not connected to a network, an optional aquastat is recommended to prevent inadvertent changeover of heating/cooling modes. For the aquastat to be most effective, place the temperature bulb as far upstream on the supply inlet pipe as possible.

# Hot Water and Chilled Water (2-Pipe) with Face & Bypass Control

Units with face and bypass control to provide heating and cooling on a single water coil (2-pipe system) shall modulate the face & bypass damper via a spring return actuator, controlled by a proportional signal (2-5.5V). The face & bypass damper regulates the amount of return air and outside air passing through the water coil. On a call for heating or cooling (depending on the season), the damper shall open proportionally based on how many degrees the room temperature is from the setpoint. The adjustable proportional band on the Carel controller is set to a default 1°F (example: damper is 50% open when room temperature is 0.5°F from setpoint). When the damper is in full bypass position (2V), all return and outside air bypasses the water coil. When the damper is in full face position (5.5V), all return and outside air passes through the water coil. If for any reason the supply air temperature drops below 55°F (12.8°C) (adjustable), the water valve shall open (if equipped) and the face and bypass damper shall modulate to maintain 55°F (12.8°C).

### 2-Position Control Valves

Optional spring-return, 2-position control valves can be used to control the end of cycle flow on both chilled and hot water coils. On a chilled water coil, a normally closed valve is used. On a hot water coil or 2-pipe changeover system, a normally open valve is used.

The 2-position valve used on a chilled water coil shall open on a call for cooling when the outside air temperature is greater than  $55^{\circ}F$  (12.8°C) (adjustable). When the outside air temperature is less than  $55^{\circ}F$  (12.8°C), the valve should remain closed and free cooling shall be utilized. The 2-position chilled water valve shall be closed when the 2-position hot water valve is open (when equipped). The valve is controlled by a 24VAC digital output.

The 2-position valve used on a hot water coil shall open on a call for heating. The valve shall always open when the outside air temperature drops below  $40^{\circ}F$  (4.4°C). This is to prevent the coil from freezing or nuisance tripping of the freeze stat.

The 2-position hot water valve shall be closed when the 2-position chilled water valve is open (if equipped). The valve is controlled by a 24VAC digital output.

The 2-position valve used on a 2-pipe changeover system shall operate like the 2-position chilled water valve in cooling mode, and like the 2-position hot water valve in heating mode.

### **Condensate Pump (Optional)**

On units equipped with a condensate pump, the pump shall begin to run once the condensate reaches a set level. The pump comes with an internal safety switch that can be wired either normally open or normally closed. The safety switch shall be wired such that the chilled water valve closes when it trips. On Carel units, the switch shall be wired normally closed into a digital input of the controller. If the unit is also equipped with a condensate pan float switch, both switches shall be wired in series.

### **Condensate Pan Float Switch (Optional)**

On units equipped with a condensate pan float switch, the normally closed switch shall be wired such that the chilled water valve closes or the outdoor condensing unit is disabled (DX Cooling Models Only) upon tripping. On Carel units, the switch shall be wired normally closed into a digital input of the controller. If the unit is also equipped with a condensate pump, both the condensate pump limit switch and condensate pan float switch shall be wired in series.

### CO<sub>2</sub> Sensor (Optional)

An optional  $CO_2$  sensor with a range of 0-2000 ppm producing an output signal of 4-20mA is available to modulate the outside air damper. If equipped, the outside air damper shall modulate open proportionally to compensate for the  $CO_2$  levels in the room. On Carel units, if the  $CO_2$  level is 800 ppm or less (adjustable), the damper shall remain at its normal minimum position. If the  $CO_2$  level increases above 800 ppm, the damper begins to open according to the proportional band. The proportional band is set to a default of 200 ppm and is adjustable. Using the default, once the  $CO_2$  level reaches 1000 ppm, the damper shall be at its maximum ventilation position.

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## **START-UP SHEET - EXAMPLE**

#### Figure 20.1 - Start-Up Sheet - EXAMPLE Page 1

		Unit V	entilator Sta	rt-up Sheet	t	
	This doc	ument should be retur	ned to Modine withi	n 30 days of start-	up to validate warranty.	
		<b>- -</b> .				
Date		Job Reference			IAG ID	
Serial #			Unit Type			
Installer			Sales Rep			
Installation	<u>n Checks</u>					
Unit mounted	dlevel		Cond	ensate drain insta	lled correctly	
Unit floor mo	unted		Gra	avity flow or Pump	assisted	
					tion tight	
Any visual da	amage		Supply Retur	n and Outside air :	vents unobstructed	
, ary visual at	anago		Cappij, Rotai			
Dry Nitrogen	Pressure Test (D	X Units Only)		Initial Test Press	ure	
				Test Duration	lre	
						·
Supply Fai	<u>n Motor</u>					
Motor Size	HP		FLA		Make	
Amps	High		Medium		Low	
RPM	High		Medium		Low	
<u>Main Volta</u>	ge		L1+N			
XFMR Volt	age		Primary		Secondary	<b></b>
Controller	information					
Males		r				[
BACnet Car	4				Program version	
Loncard	4					
Occupied Se	t point		1			
Unoccupied	Set point					
<u>Air Tempe</u>	<u>ratures</u>	Cooling	_	<u>Heating</u>	L	
Return Air Te	emp		°F		°F	
Supply Air Te	emp -		°F 		°F	
Out door Air	Temp		_ °F		°F	
<u>Componer</u>	nt Tests (If App	<u>licable)</u>				
Airflow Switc	h tested					
Aqua Stat tes	sted					
Chilled Wate	r valve tested					
Concensate Remote chut	pump tested					
	uown ink tested					
Drain nan hir	th limit switch test	ed				
Fresh air & a	nd return air dam	per tested				
Electromech	anically tested					
Filter change	switch tested					
Smoke detec	ctor tested					
Freeze stat s	et at 35°F and tes	sted				
Freeze stat a	auto or manual res	set				
Hot Water/St	eam valve tested	1				
Fire stat / link	< tested			1 1		

## **START-UP SHEET - EXAMPLE**

### Figure 21.1 - Start-Up Sheet - EXAMPLE Page 2

	Unit Ventilator Start-up Sheet	
Outdoor Unit Check List (DX		
Brand	Model Serial Num Primary Secondar Psig Psig F F F F	ber
Technicians Notes:		
Customer Feedback: Please relay a	any comments regarding quality and service	
Service Technician		
Service Technician Service Company Service Company Telephone		
Service Technician Service Company Service Company Telephone		
Service Technician Service Company Service Company Telephone		

#### Figure 22.1 - Dimensions - 16-5/8" Depth - Floor Mounted Unit



① Dimensions shown are inches (mm).

Table 22.1	- Unit Width	Dimensions
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Model Size		Dimensions	
Wodel Size	W1	W2	W3
750	62" (1574.8mm)	36" (914.4mm)	30" (762mm)
1000	74" (1879.6 mm)	48" (1219.2 mm)	42" (1066.8 mm)
1250	86" (2184.4 mm)	60" (1524 mm)	54" (1371.6 mm)
1500	98" (2489.2 mm)	72" (1828.8mm)	66" (1676.4m)

#### Figure 23.1 - Dimensions - 21-7/8" Depth - Floor Mounted Unit



① Dimensions shown are inches (mm).

 Table 23.1 - Unit Width Dimensions

Model Size	Dimensions (inches)						
Wodel Size	W1	W2	W3				
750	62" (1574.8mm)	36" (914.4mm)	30" (762mm)				
1000	74" (1879.6 mm)	48" (1219.2 mm)	42" (1066.8 mm)				
1250	86" (2184.4 mm)	60" (1524 mm)	54" (1371.6 mm)				
1500	98" (2489.2 mm)	72" (1828.8mm)	66" (1676.4m)				

#### Figure 24.1 - Dimensions - Front Discharge - Ceiling Mounted Unit



① Dimensions shown are inches (mm).

#### Table 24.1 - Unit Width Dimensions

Model Size	Dimensions (inches)				
Wodel Size	W1	W2			
750	62" (1574.8mm)	36" (914.4mm)			
1000	74" (1879.6 mm)	48" (1219.2 mm)			
1250	86" (2184.4 mm)	60" (1524 mm)			
1500	98" (2489.2 mm)	72" (1828.8mm)			



#### Figure 25.1 - Dimensions - Down Discharge - Ceiling Mounted Unit

① Dimensions shown are inches (mm).

#### Table 25.1 - Unit Width Dimensions

Madal Siza	Dimensions (inches)				
Wodel Size	W1	W2			
750	62" (1574.8mm)	36" (914.4mm)			
1000	74" (1879.6 mm)	48" (1219.2 mm)			
1250	86" (2184.4 mm)	60" (1524 mm)			
1500	98" (2489.2 mm)	72" (1828.8mm)			

## **COOLING PIPING LOCATIONS - FLOOR UNITS ONLY**

## **CHILLED WATER - NO PIPING PACKAGE**

Figure 26.1 - Chilled Water Coil with or without Optional Reheat Coil

Figure 26.2 - Chilled Water Coil with Pre-Heat Coil





**Note:** Supply and Return connection locations represent counterflow orientation (recommended). Unit should be piped in accordance with good plumbing practices.

Unit Depth			16 5/8"			21 7/8"			
Coil	Rows	2	3	4	2	3	4		
	А	14.25"	15.00"	15.00"	14.25"	15.00"	15.00"		
	В	11.25"	11.00"	11.00"	16.50"	16.25"	16.25"		
(in.)	С	7.25"	7.50"	7.50"	7.25"	7.50"	7.50"		
ions	D	4.75"	4.75"	4.75"	10.00"	10.00"	10.00"		
lensi	Е	13.50"	13.50"	14.00"	13.50"	13.50"	14.00"		
Dim	F	12.25"	12.00"	11.75"	17.50"	17.25"	17.00"		
	G	8.25"	8.75"	9.50"	8.25"	8.75"	9.50"		
	н	4.00"	3.50"	3.00"	10.00"	8.75"	8.25"		

Table 26.1	- Piping	Location	Dimensions	1
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## O For Hot Water Reheat piping locations see Figure 28.2. For Steam Reheat piping locations see Figure 29.2.

#### Table 26.2 - Piping Location Dimensions ${\rm \textcircled{1}}$

Unit Depth			16 5/8"		21 7/8"		
Coil	Rows	2	3	4	2	3	4
	А	17.50"	17.50"	16.75"	17.50"	17.50"	16.75"
	В	8.75"	8.75"	9.25"	14.00"	14.00"	14.50"
(in.)	С	10.50"	10.00"	9.25"	10.50"	10.00"	9.25"
ons	D	2.25"	2.75"	3.25"	7.50"	8.00"	8.50"
lensi	E	16.50"	16.00"	16.00"	16.50"	16.00"	16.00"
Dir	F	9.50"	10.00"	10.00"	14.75"	15.25"	15.25"
	G	11.50"	11.25"	11.25"	11.50"	11.25"	11.25"
	н	1.50"	1.50"	1.50"	6.75"	6.75"	6.75"

O For Hot Water Pre-Heat piping locations see Figure 28.1. For Steam Pre-Heat piping locations see Figure 29.1.

## **COOLING PIPING LOCATIONS - FLOOR UNITS ONLY**

### DIRECT EXPANSION (DX) SIZE 750 ONLY - NO PIPING PACKAGE

Figure 27.1 - DX Cooling (Size 750) with or without Optional Reheat Coil



① For Hot Water Reheat piping location see Figure 29.2. For Steam Reheat piping location see Figure 30.2.

② A 16-5/8" depth unit is represented in the dimensional drawing above. For 21-7/8" depth units, add 5.25 inches to dimensions that are taken from the rear of the unit.

#### Figure 27.2 - DX Cooling (Size 750) with Pre-Heat Coil



① For Hot Water Pre-Heat piping location see Figure 29.1. For Steam Pre-Heat piping location see Figure 30.1.

② A 16-5/8" depth unit is represented in the dimensional drawing above. For 21-7/8" depth units, add 5.25 inches to dimensions that are taken from the rear of the unit.

## **DIRECT EXPANSION (DX) SIZE 1000-1500 - NO PIPING PACKAGE**

Figure 27.3 - DX Cooling (Size 1000-1500) with or without Optional Reheat Coil



 For Hot Water Reheat piping location see Figure 29.2. For Steam Reheat piping location see Figure 30.2.

② A 16-5/8" depth unit is represented in the dimensional drawing above. For 21-7/8" depth units, add 5.25 inches to dimensions that are taken from the rear of the unit.

## Figure 27.4 - DX Cooling (Size 1000-1500) with Pre-Heat Coil



① For Hot Water Pre-Heat piping location see Figure 29.1. For Steam Pre-Heat piping location see Figure 30.1.

② A 16-5/8" depth unit is represented in the dimensional drawing above. For 21-7/8" depth units, add 5.25 inches to dimensions that are taken from the rear of the unit.

## **HEATING PIPING LOCATIONS - FLOOR UNITS ONLY**

### HOT WATER HEATING COIL - NO PIPING PACKAGE

#### Figure 28.1 - Hot Water Only or Chilled Water/DX Cooling Coil with Hot Water Pre-Heat Coil



**Note:** Supply and Return connection locations represent counterflow orientation (recommended). Unit should be piped in accordance with good plumbing practices.

 Table 28.1 - Hot Water Heating Coil Piping Locations ①

Linit Donth					Dimensio	ons (inches)			
		A	В	С	D	E	F	G	н
40 5/01	1-Row	14.25"	11.50" (292.1mm)	7.00" (177.8mm)	5.00" (127.0mm)	13.50" (342.9mm)	12.00" (304.8mm)	8.25" (209.5mm)	4.00" (101.6mm)
10 5/6	2-Row	114.25"	11.25" (285.7mm)	7.25" (184.1mm)	4.75" (120.6mm)	13.50" (342.9mm)	12.25" (311.1mm)	8.25" (209.5mm)	4.00" (101.6mm)
04.7/0"	1-Row	14.25"	16.75" (425.4m)	7.00" (177.8mm)	10.25" (260.3mm)	13.50" (342.9mm)	17.25" (438.1mm)	8.25" (209.5mm)	9.25" (234.9mm)
21 7/8"	2-Row	14.25"	16.50" (419.1mm)	7.25" (184.1mm)	10.00" (254.0mm)	13.50" (342.9mm)	17.50" (444.5mm)	8.25" (209.5mm)	9.25" (234.9mm)
1 For Chilled Wa	D For Chilled Water piping location see Figure 26.2. For DX Cooling piping location see Figure 27.2 and Figure 27.4.								

#### Figure 28.2 - Hot Water Reheat Coil with Chilled Water/DX Cooling Coil



**Note:** Supply and Return connection locations represent counterflow orientation (recommended). Unit should be piped up in accordance with good plumbing practices.

Table 28.2 - Hot Water Reheat Coil Piping Locations ①

Unit Donth			Dimensions (inches)						
Onit Depth	Coll Rows	A	В	С	D	E	F	G	Н
16 5/8"	1-Row	17.50"	8.75"	10.25"	2.25"	16.75"	9.50"	11.50"	1.25"
	2-Row	17.50"	8.75"	10.50"	2.25"	16.50"	9.50"	11.50"	1.50"
21 7/8"	1-Row	17.50"	14.00"	10.25"	7.50"	16.75"	14.75"	11.50"	6.50"
	2-Row	17.50"	14.00"	10.50"	7.50"	16.50"	14.75"	11.50"	6.75"

<sup>①</sup> For Chilled Water piping location see Figure 26.1. For DX Cooling piping location see Figure 27.1 and Figure 27.3.

## **HEATING PIPING LOCATIONS - FLOOR UNITS ONLY**

#### STEAM HEATING COIL -Figure 29.1 - Steam Heating Coil Only or Chilled Water/DX Cooling Coil with Steam Pre-Heat Coil



#### Table 29.1 - Steam Heating Coil Piping Locations 0

Unit Donth	Coil Bowa	Dimensions (inches)				
Unit Depth	Coll Rows	A	В			
16 5/8"	1-Row	12.25"	4.00"			
21 7/8"	1-Row	17.50"	9.25"			
21 7/8"	1-Row	12.25	9.25"			

③ For Chilled Water piping location see Figure 26.2. For DX Cooling piping location see Figure 27.2 and Figure 27.4.

**STEAM HEATING COIL - NO PIPING PACKAGE** 

Figure 29.2 - Steam Reheat Coil with Chilled Water/DX Cooling Coil



#### Table 29.2 - Steam Reheat Coil Piping Locations 0

Unit Donth	Coil Powe	Dimensions (inches)				
Unit Depth	Coll Rows	А	В			
16 5/8"	1-Row	9.50"	1.25"			
21 7/8"	1-Row	14.75"	6.50"			

③ For Chilled Water piping location see Figure 26.1. For DX Cooling piping location see Figure 27.1 and Figure 27.3.

## **COOLING PIPING LOCATIONS - PIPING PACKAGE**



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## **COOLING PIPING LOCATIONS - PIPING PACKAGE**

### **DIRECT EXPANSION (DX) SIZE 750 ONLY - WITH PIPING PACKAGE**

Figure 31.1 - DX Cooling Coil Only or DX Cooling with Reheat Coil



Unit Size: 750

- ① A 16-5/8" depth unit is represented in the dimensional drawing above. For 21-7/8" depth units, add 5.25 inches to dimensions that are taken from the rear of the unit.
- ② Condensate drain connection located in right end compartment.





#### Unit Size: 750

**RIGHT HAND CONNECTIONS** 

Û

AIR FLOW

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- ① A 16-5/8" depth unit is represented in the dimensional drawing above. For 21-7/8" depth units, add 5.25 inches to dimensions that are taken from the rear of the unit
- ② Condensate drain connection located in right end compartment.

DA

② Condensate drain connection located in right end compartment.

RA

LL = Liquid Line

SL = Suction Line

Unit Size: 1000 / 1250 / 1500

A 16-5/8" depth unit is represented in the dimensional drawing above. For

21-7/8" depth units, add 5.25 inches to dimensions that are taken from the

LEFT HAND CONNECTIONS

TOP VIEW

SIDE VIEW

17

AIR FLOW

0 LL 0 SL

#### DIRECT EXPANSION (DX) SIZE 1000-1500 - WITH PIPING PACKAGE Figure 31.3 - DX Cooling Coil Only or DX Cooling with Reheat Coil

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- 7.00

rear of the unit.





① A 16-5/8" depth unit is represented in the dimensional drawing above. For 21-7/8" depth units, add 5.25 inches to dimensions that are taken from the rear of the unit.

② Condensate drain connection located in right end compartment.

Note: All dimensions shown on this page are in inches and are for reference only. For dimensions in mm, multiply inches by 25.4.

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## **HEATING PIPING LOCATIONS - PIPING PACKAGE**

### **HOT WATER HEATING COIL - WITH PIPING PACKAGE**

Figure 32.1 - Hot Water Heating Coil Only or Chilled Water/DX Cooling Coil with Hot Water Pre-Heat Coil



① Condensate drain connection located in right end compartment when unit is equipped with a cooling coil.

Figure 32.2 - Chilled Water/DX Cooling Coil with Hot Water Reheat Coil



O Condensate drain connection located in right end compartment when unit is equipped with a cooling coil.

## **HEATING PIPING LOCATIONS - PIPING PACKAGE**

## STEAM HEATING COIL - WITH PIPING PACKAGE

Figure 33.1 - Steam Heating Coil Only or Chilled Water/DX Cooling Coil with Steam Pre-Heat Coil



 Condensate drain connection located in right end compartment when unit is equipped with a cooling coil.

② For Dimensions A and B, refer to Table 29.1.

Figure 33.2 - Chilled Water/DX Cooling Coil with Steam Reheat Coil



 $\ensuremath{\mathbb O}$  Condensate drain connection located in right end compartment when unit is equipped with a cooling coil.

© For Dimensions A and B, refer to Table 29.2.

## **TECHNICAL DATA**

### Table 34.1 - Technical Data

			Model Size				
DESCRIPTION			UNITS	750	1000	1250	1500
		Fan Type		Direct Drive Centrifugal			
		Fan Quantity	Qty	2	3	4	4
		Fan Diameter		8.06	8.06	8.06	8.06
		Fan Width		7.15	7.15	7.15	7.15
		Airflow (High/Madium/Low)	cfm	750/650/500	1000/750/600	1250/900/750	1500/1100/900
		Airliow (Aigh/Medium/Low)	l/s	354/307/236	472/354/283	590/425/354	708/519/425
	STANDARD	Motor Type		ECM	и - Electonically	Commutated M	otor
AN N	MOTOR	Motor Size (Qty 1)		1/3hp (0.25kW)	1/3hp (0.25kW)	1/3hp (0.25kW)	1/3hp (0.25kW)
Х Ч Ч Ч	(Digit 16=4 or 5)	Max External Static Pressure	in.Wg	0.05	0.05	0.05	0.05
	HIGH STATIC	Motor Type (Premium High Static)		ECM	A - Electonically	Commutated M	otor
Ins 1	MOTOR	Motor Size (Qty 1)		1/2hp (0.37kW)	1/2hp (0.37kW)	1/2hp (0.37kW)	1/2hp (0.37kW)
	(Digit 16=2 or 3)	Max External Static Pressure	in.Wg	0.25	0.25	0.25	0.25
		1 Row		0.32 gal (1.2 l/s)	0.38 gal (1.4 l/s)	0.44 gal (1.7 l/s)	0.5 gal (1.9 l/s)
COIL	WATER VOLUME	2 Row		0.51 gal (1.9 l/s)	0.63 gal (2.4 l/s)	0.76 gal (2.9 l/s)	0.88 gal (3.3 l/s)
		4 Row		0.92 gal (3.5 l/s)	1.17 gal (4.4 l/s)	1.42 gal (5.4 l/s)	1.66 gal (6.3 l/s)
		Water Coils - Standard Units		U	nions with 3/4" f	emale solder joi	nt
		Water Coils - Units w/Piping Pkg		Chilled Water: 3	/4" NPT drop ea	ar, Hot Water: 1/2	2" NPT drop ear
COIL	CONNECTIONS	Evaporator Coil			3/4" OD Suction	i, 1/2" OD Liquid	
		Steam Coil			1" N	NPT	
		Condensate Line			3/4" ID cond	densate line	
		Floor Mounted, 16 5/8" Units		410 lbs (186 kgs)	470 lbs (213 kgs)	525 lbs (238 kgs)	580 lbs (263 kgs)
	T OPERATING WEIGHT	Floor Mounted, 21 7/8" Units		445 lbs (202 kgs)	510 lbs (231 kgs)	570 lbs (259 kgs)	630 lbs (286 kgs)
(2	ipproximate)	Ceiling Mounted Units		510 lbs (231 kgs)	580 lbs (263 kgs)	645 lbs (293 kgs)	710 lbs (322 kgs)
		Quantity	Qty	1	2	2	2
4	IR FILTERS	Dimensione	Inches	10 X 36	10 X 24	10 X 30	10 X 36
			mm	254 X 914	254 X 610	254 X 762	254 X 914

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## **COMPONENT LAYOUT - FLOOR MOUNTED UNITS**

#### Figure 36.1 - Exploded View



Figure 36.2 - Component Layout



## **COMPONENT LAYOUT - CEILING MOUNTED UNITS**

### Figure 37.1 - Exploded View



### MAINTENANCE

## WARNING

- Disconnect power supply before making wiring connections or working on this equipment. Follow all applicable safety procedures to prevent accidental power up. Failure to do so can result in injury or death from electrical shock or moving parts and may cause equipment damage.
- 2. When servicing or repairing this equipment, use only factory-approved service replacement parts. A complete replacement parts list may be obtained by contacting the factory. Refer to the rating plate on the appliance for complete appliance model number, serial number, and company address. Any substitution of parts or controls not approved by the factory will be at the owner's risk.
- Units with DX evaporator coils (refer to model nomenclature) contain R-454B high pressure refrigerant. Hazards exist that could result in personal injury or death. Installation, maintenance, and service must only be performed by an HVAC technician qualified in R-454B refrigerant and using proper tools and equipment. Due to much higher pressure of R-454B refrigerant, DO NOT USE service equipment or tools designed for refrigerants other than R-454B.
- Do not use a means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.
- 5. Do not pierce or burn any portion of the refrigeration system.
- Do not use open flames for detection of refrigerant leaks. Use only electronic leak detectors or non-chlorinated leak detection fluids.
- 7. Be aware that refrigerants may not contain an odor.

# **AVERTISSEMENT**

- Débranchez l'alimentation électrique avant d'effectuer des connexions ou de travailler sur l'appareil. Respectez toutes les procédures de sécurité qui s'appliquent pour éviter toute mise en marche accidentelle. Le non-respect de cette directive peut entraîner des blessures ou la mort causées par un choc électrique ou des pièces mobiles, en plus d'endommager l'appareil.
- 2. Pour l'entretien et les réparations de cet appareil, utilisez uniquement des pièces d'origine certifiées. Pour la liste complete des pièces de rechange, consultez Modine Manufacturing Company. Le numéro de modèle complet, le numéro de série et l'adresse du fabricant figurent sur la plaque signalétique fixée à l'appareil. Toute substitution de pièce ou decommande non approuvée par le fabricant sera aux risques du propriétaire.
- 3. Les unités munies de serpentins évaporateurs DX (reportez-vous à la nomenclature du modèle) contiennent du fluide frigorigène à haute pression R-454B. Des dangers existent qui, s'ils se matérialisent, pourraient entraîner des blessures ou la mort. L'installation, l'entretien et le service ne doivent être effectués que par un technicien de CVC qualifié quant à l'usage du fluide frigorigène R-454B en utilisant les outils et l'équipement appropriés. En raison de la pression beaucoup plus élevée du fluide frigorigène R-454B, N'utilisez PAS des outils ou de l'équipement de service qui ne sont pas conçus spécifiquement pour le R-454B.
- N'utilisez pas un moyen d'accélérer le processus de dégivrage ou de nettoyage, autre que ceux recommandés par le fabricant.
- 5. Ne percez ni ne brûlez aucune partie du système de réfrigération.

# 

- N'utilisez pas de flammes nues pour détecter les fuites de réfrigérant. N'utilisez que des détecteurs de fuites électroniques ou des fluides de détection de fuites non chlorés.
- 7. Sachez que les réfrigérants peuvent ne pas contenir d'odeur.

## CAUTION

- Do not attempt to reuse any mechanical or electrical controllers which have been wet. Replace defective controller.
- 2. When servicing the unit, some components may be hot enough to cause pain or injury. Allow time for cooling of hot components before servicing.

## ATTENTION

- Ne tentez pas de réutiliser un composant mécanique ou électrique qui a été mouillé. Ces composants doivent être remplacés.
- Durant l'entretien de l'unité, certains composants peuvent être assez chauds pour causer de la douleur ou une blessure. Laissez les composants chauds se refroidir avant de procéder à tout entretien.

# **IMPORTANT**

- 1. Start up and adjustment procedures, installation, and service of these appliances must be performed by a qualified installation and service agency.
- 2. No water-flow can cause a freeze condition resulting in damage to the coil.
- 3. To check most of the possible remedies in the troubleshooting guide listed in *Table 44.1 & Table 45.1*, refer to the applicable sections of the manual.

# IMPORTANT

- Les procédures de démarrage et de réglage, l'installation et le service de ces appareils doivent être confiés à un centre d'installation et de service qualifié.
- 2. L'absence d'écoulement d'eau risque de causer une condition de gel et d'endommager le serpentin.
- 3. Pour essayer la plupart des solutions possibles suggérées dans le guide de dépannage du *Table 44.1 & Table 45.1*, reportez-vous aux sections correspondantes du manuel.

The routine care and maintenance of this unit will increase longevity, provide for the proper operational performance, and reduce the probability of failure.

Once the unit is operational, it will be necessary to perform certain routine maintenance/service checks. Following is a Maintenance Schedule with the recommended checks. If your unit is equipped with special features, there may be additional checks that are required. Consult Modine for assistance.

The use of torque screwdrivers on panel, cover or component mounting screws is not recommended. Hand-start all screws. If electric drills are used – set at the lowest possible torque.

#### Access

Access to the unit is gained by opening the front panels and hinged top side covers using the key that is provided on Floor Mounted units or by opening the bottom access panels on Ceiling Mounted units.

#### **Precautions for Work with Flammable Refrigerants**

Prior to beginning work on systems containing FLAMMABLE REFRIGERANTS, safety checks are necessary to ensure that the risk of ignition is minimized.

- 1. Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed.
- 2. All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.
- The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants.
- 4. If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.
- 5. No person carrying out work in relation to a refrigeration system which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.
- 6. Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.
- 7. Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance.
- 8. The following checks shall be applied to installations using FLAMMABLE REFRIGERANTS:
  - a. The actual REFRIGERANT CHARGE is in accordance with the room size within which the refrigerant containing parts are installed;
  - b. The ventilation machinery and outlets are operating adequately and are not obstructed;
  - If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;
  - d. Marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected;
  - e. Refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing

components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

#### **Checks to Electrical Devices**

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised. Initial safety checks shall include:

- a. That capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking
- b. That no live electrical components and wiring are exposed while charging, recovering or purging the system
- c. That there is continuity of earth bonding.

#### Repair Work

When performing maintenance to units with faulty components, it is important to note that sealed electrical components & intrinsically safe components (such as the compressor, solid state relays,motors) shall be replaced and repairs should not be attempted.

#### **Detection of Flammable Refrigerants**

- 1. Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.
- 2. The following leak detection methods are deemed acceptable for all refrigerant systems:
  - a. Electronic leak detectors may be used to detect refrigerant leaks but, in the case of FLAMMABLE REFRIGERANTS, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used.
  - b. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed.
  - c. Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.
- 3. Examples of leak detection fluids are:
  - a. Bubble Method.
  - b. Fluorescent method agents.
- 4. If a leak is suspected, all naked flames shall be removed/ extinguished.
- 5. If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak.
- 6. Removal of refrigerant shall be according to "Refrigerant Removal and Evacuation" Section.

#### **Charging Procedure**

In addition to conventional charging procedures, the following requirements shall be followed.

- 1. Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas.
- 2. Use only charging equipment used with R-454B refrigerant to ensure that contamination of different refrigerants does not occur.
- 3. Verify the unit to be charged is labeled for use with R-454B refrigerant.
- 4. Charging hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- 5. Cylinders shall be kept in an appropriate position according to the instructions.
- 6. Ensure that the refrigeration system is grounded prior to charging the system with refrigerant.
- 7. Label the system when charging is complete (if not already).
- 8. Extreme care shall be taken not to overfill the refrigeration system.
- 9. The system shall be leak-tested on completion of charging but prior to commissioning and again prior to leaving the site. Do not use an open flame for refrigerant leak testing.

#### **Refrigerant Removal and Evacuation**

When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration. The following procedure shall be adhered to:

- 1. Safely remove refrigerant following local and national regulations;
  - a. Evacuate
  - b. Purge the circuit with inert gas (optional for A2L)
  - c. Evacuate (optional for A2L)
  - d. Continuously flush or purge with inert gas when using flame to open circuit
  - e. Open the circuit.
- 2. The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes.
- 3. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times.
- 4. Compressed air or oxygen shall not be used for purging refrigerant systems.
- 5. For appliances containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum (optional). This process shall be repeated until no refrigerant is within the system (optional).
- 6. When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.
- 7. The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

#### **Refrigerant Recovery**

When removing refrigerants from a system, either for servicing or decommissioning, all refrigerants are to be removed safely following local and national regulations. The following are additional items that must be followed:

- 1. When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed.
- 2. Ensure that the correct number of cylinders for holding the total system charge is available.
- 3. All cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant (i.e. special cylinders for the recovery of the refrigerant). Do not mix different types of refrigerants.
- 4. Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order.
- 5. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.
- 6. The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the flammable refrigerant. If in doubt, the manufacturer should be consulted.
- 7. A set of calibrated weighing scales shall be available and in good working order.
- 8. Hoses shall be complete with leak-free disconnect couplings and in good condition.
- The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.
- 10. If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

#### Decommissioning

Decommissioning occurs when equipment will no longer be used and is to be physically removed. Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail by reviewing this Installation and Service Manual in its entirety. Refrigerants must be recovered safely. Prior to decommissioning, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. Ensure that electrical power is available separate from the unit to power tools and refrigerant evacuation equipment.

The following are the general steps in decommissioning the equipment:

- 1. Become familiar with the equipment and its operation.
- 2. Isolate the equipment electrically.
- 3. Before the decommissioning procedure, ensure that:
  - a. Mechanical handling equipment is available, if required, for handling refrigerant cylinders;
  - b. All personal protective equipment is available and being used correctly
  - c. The recovery process is supervised at all times by a competent person;
  - d. Recovery equipment and cylinders conform to the appropriate standards.
- Recover the refrigeration system refrigerant using the recovery pump, operating in accordance with manufacturer instructions.
- 5. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
- 6. Make sure that cylinder is situated on the scales before recovery takes place.
- 7. Start the recovery machine and operate in accordance with instructions.
- 8. Do not overfill cylinders (no more than 80 % volume liquid charge)
- 9. Do not exceed the maximum working pressure of the cylinder, even temporarily.
- 10. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
- 11. Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked.
- 12. Equipment shall be labeled stating that it has been decommissioned and emptied of refrigerant. The label shall be dated and signed. Ensure that there are labels on the unit stating the unit contains a flammable refrigerant.

#### Maintenance Schedule

#### Every ONE (1) MONTH

With the Disconnect in the "OFF" position: check the filter(s) and replace if necessary. Slide the filter(s) out of the track and replace with new filter(s). See *Figure 42.1 & Figure 42.3*. The filters are positioned under the coil assembly. Never run the unit without filters.

## Every SIX (6) MONTHS (Before the heating and cooling season)

1. Check for correct fan operation, no excessive noise or vibrations.

#### With the Disconnect Switch in the "OFF" position:

- Inspect all electrical circuits including optional components and sensors for loose connections and signs of overheating, arcing, chafing or other physical damage. The electrical control section should also be wiped clean of all dirt that may affect the unit operation.
- Check the filter(s) and replace if necessary. Slide the filter(s) out of the track and replace with new filter(s) (see *Figure 42.1 & Figure 42.3*). The filters are positioned under the coil assembly. Never run the unit without filters.
- 4. Check the control wiring and sensors. Check the operation and sequencing of controls and ensure that all relevant set points are recorded.
- 5. Check all warning labels to ensure they can be read and that they have not been removed.
- 6. Inspect condensate hose for any possible clogs.
- 7. Check for general obstructions to inlet and discharge openings.
- Fill the fan shaft bearing cup with oil. The fan shaft bearing is located in the housing at the opposite end of the fan shaft from the motor (see *Figure 42.1* and *Figure 42.3*). Additional bearing cup in middle of unit on 1250 and 1500 CFM units and is accessible through the front panel.

For units with DX evaporator coils (Model Digit 10=5):

- 9. Inspect the Refrigerant Detection System sensors for any signs of damage or contamination.
- Verify the Refrigerant Detection System is functioning properly by disconnecting the refrigerant leak sensors. The unit should initiate the mitigation actions noted in the "Refrigeration Detection System" section. Once verified, reconnect the sensors.
- 11. The Refrigerant Detection System uses refrigerant sensors with a predetermined lifespan (approximately 10 years). The Refrigerant Detection System will indicate when a sensor has reached its end-of-life via a blinking red LED light on the sensor. For units equipped with the Modine Control Systems, an end of life alarm will be generated. The sensors must only be replaced with those specified by Modine. Using unauthorized sensors may compromise safety and accuracy.

#### **Replacement Parts**

When servicing, repairing or replacing parts on these units, locate the model serial plate on the unit and always give the complete Model Number and Serial Number from the unit. For a complete description of the model number, see Model Nomenclature, *Table 46.1*.

## **MAINTENANCE - COMPONENT LOCATION**

#### Figure 42.1 - Filter Location - Floor Mounted Units



Figure 42.2 - End Shaft Bearing Cup Location



Figure 42.3 - Filter Location - Ceiling Mounted Units







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## TROUBLESHOOTING

### Table 44.1 - Troubleshooting - General

Trouble	Possible Cause	Possible Remedy
A. Unit Not Operating - Power On	1. Unit mounted disconnect in the "OFF" position.	<ol> <li>Turn the disconnect switch to the "ON" position.</li> </ol>
	<ol> <li>Unit mounted 3-speed selector switch in the "0" position (if equipped with a 4-position switch).</li> </ol>	<ol> <li>Turn the 3-speed selector switch to the "1, 2, or 3" position.</li> </ol>
	3. Unit switched OFF in the microprocessor.	3. Consult microprocessor documentation.
	4. Delay on start set incorrectly.	4. Consult microprocessor documentation.
	5. Unit not in occupied mode.	<ol> <li>Consult microprocessor documentation, and consult microprocessor occupied setpoints.</li> </ol>
	6. Fire/smoke alarm tripped.	6. De-energize and re-energize unit.
	7. Tripped circuit breakers.	7. Reset the tripped circuit breaker(s).
	8. Loose mains or control wiring.	<ol> <li>With power OFF from distribution panel inspect the field wiring connections in the electrical panel.</li> </ol>
	9. Occupancy sensor malfunction.	9. Inspect connections beginning with sensor input from the microprocessor.
	10. Hot water freeze protection (optional) stat tripped.	10. Manually reset at stat.
B. Unit Operating - No Mechanical Heating / Cooling	1. Heating/cooling not required.	1. Verify applicable set point with return air temperature.
	2. No output from microprocessor.	2. Consult microprocessor documentation.
	<ol> <li>DX Split Units Only: HP/LP pressure safety switch(es) tripped (open).</li> </ol>	<ol> <li>Inspect high and low system pressures and wiring. Check for dirty filters in Heat Pump mode.</li> </ol>
	<ol> <li>DX Split Units Only: Internal overload switch on compressor tripped (open).</li> </ol>	4. Wait for compressor motor windings to cool down (This switch is automatic reset).
	5. Loose control wiring connections.	<ol> <li>Inspect connections beginning with compressor output from the microprocessor.</li> </ol>
	6. Tripped circuit breakers.	6. Reset the tripped circuit breaker(s).
	7. Low temperature unit lockout.	7. Consult microprocessor setpoints.
	8. DX Split Units Only: Compressor faulty.	8. Replace compressor.
	9. Condensate pan/pump float switch tripped.	<ol> <li>Check condensate pan/pump and piping for blockage.</li> </ol>
C. No Indoor Fan	1. Motor tripped on internal overload.	<ol> <li>Let motor cool down and reset - possible bad motor or blocked filter.</li> </ol>
	2. Fan not required	<ol> <li>Consult microprocessor documentation, or set thermostat to "ON". Check if unit is in unoccupied and standby mode.</li> </ol>
	3. No power to the fan.	<ol> <li>Check to make sure plugs are locked in place and all pins are secure. Check for 24V control signal.</li> </ol>
	4. Current sensor fault.	4. Make sure sensor is functioning correctly.
D. Hot Water / Chilled Water	1. Heating not required.	1. Consult microprocessor documentation.
Valve Not Operational (Option)	2. Loose wiring connections.	<ol> <li>Inspect connections beginning with valve output from the microprocessor. Check to ensure 24V supply power is present at actuator.</li> </ol>
	3. Faulty heating actuator.	3. Replace actuator if faulty.
	4. Isolation valves are open.	4. Check for additional external isolation valves.
	5. Check for DC control signal.	<ol> <li>Check for 2-10vDC signal from microprocessor.</li> </ol>

## TROUBLESHOOTING

### Table 45.1 - Troubleshooting - Continued

Trouble	Possible Cause Possible Remedy						
E. DX Split Units Only: Low Suction Pressure (LP Switch	1. Low refrigeration charge.	1. Measure unit operating pressures. Add charge and check for leaks.					
Tripped)	2. Clogged filter(s).	2. Replace filter(s) as necessary.					
	3. Clogged liquid line filter drier.	<ol> <li>Replace drier with a direct replacement. Follow proper procedure.</li> </ol>					
	<ol> <li>Improper expansion valve setting or valve malfunctioning.</li> </ol>	4. Check operation and superheat settings.					
	5. Low/restricted supply airflow.	<ol><li>Check diffusers, filters and supply motor to ensure appropriate airflow.</li></ol>					
F. DX Split Units Only: Low Discharge Pressure	1. Low refrigeration charge.	1. Measure unit operating pressures. Add charge and check for leaks.					
	2. Faulty compressor.	2. Replace compressor.					
	3. Faulty reversing valve.	3. Evacuate system and replace reversing valve.					
	4. Outdoor air sensor out of calibration.	4. Check outdoor air sensor for accuracy.					
G. DX Split Units Only: High	1. Excessive load.	1. Check occupancy of space.					
Suction Pressure	2. Expansion valve malfunctioning (overfeeding).	<ol> <li>Check remote bulb is secure and vapor sealed, and regulate superheat.</li> </ol>					
	3. Faulty compressor.	3. Replace compressor.					
H. DX Split Units Only: High Discharge Pressure	1. Improper installation of wall sleeve and louver.	1. Ensure splitter plate is in contact with the back of the louver blade and the unit to ensure no re-circulation of exhaust air takes place.					
	2. Dirty condenser coils.	2. Clean condenser coil.					
	3. System overcharged.	3. Remove excess refrigerant.					
	4. Noncondensables in system.	4. Evacuate refrigerant circuit and recharge.					
	5. Condenser fan speed is too slow (cooling mode).	5. Not applicable, refer to manufacturer's Technical Manual.					
I. Condensate Leaking	1. Condensate drain not piped up.	1. Pipe condensate drain.					
	2. Condensate pan/line plugged.	2. Clean drain pan and piping.					
	3. Condensate pump (optional) faulty.	<ol> <li>Check operation of condensate pump. Replace pump if necessary.</li> </ol>					
J. Microprocessor Not Working- Faulty Operation	1. Loose sensor wire connectors.	1. Inspect sensor connections at the microprocessor.					
	2. Strategy file corrupted.	2. Consult microprocessor documentation.					
	3. Loose control wiring.	3. Check 24V power supply wiring.					
K. Hot Water / Chilled Water	1. Heating not required.	1. Consult microprocessor documentation.					
(Option)	2. Loose wiring connections.	<ol> <li>Inspect connections beginning with valve output from the microprocessor. Check to ensure 24V supply power is present at actuator.</li> </ol>					
	3. Faulty heating actuator.	3. Replace actuator if faulty.					
	4. Isolation valves are open.	4. Check for additional external isolation valves.					
	5. Check for DC control signal.	<ol> <li>Check for 2-10vDC signal from microprocessor.</li> </ol>					

## MODEL NOMENCLATURE

#### Table 46.1 - Model Nomenclature

1

1	2	3	4-7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
PT	S	CC	US	IA	DA	со	НО	CA	СР	OA	sv	МТ	EC	С	DG	FL	PC	PH

1 - Product Type (PT)
V or Z Ventilator
2 - Style (S)
F - Floor Mounted
C - Ceiling Mounted
3 - Cooling Control (CC)
V - Valve Control
F - Face and Bypass
4,5,6,7 - Unit Size (US)
0750 - 750 CFM
1000 - 1000 CFM
1250 - 1250 CFM
1500 - 1500 CFM
8 - Inlet Air (IA)
Floor Mounted 16 5/8" Deep
A - Rear OA Open Pipe Tunnel
B - Rear OA, Closed Pipe Tunnel
D - No OA, Open Pipe Tunnel
Floor Mounted 21 7/8" Deep
E - Rear OA, Open Pipe Tunnel
F - Rear OA, Closed Pipe Tunnel
J - No OA, Closed Back, Closed PT
K- Rear OA, 2" Step-Down, Open PT
L- Rear OA, 2" Step-Down, Closed PT
(PT = Pipe Tunnel)

#### **Ceiling Mounted Units**

- M Bottom Return Air, Rear Outside Air
- N Bottom Return Air, Top Outside Air
- P Rear Return Air, Top Outside Air
- Q Rear Return Air, Bottom Outside Air
- R Bottom Return Air, No Outside Air
- S Top Return Air, No Outside Air

#### 9 - Discharge Air (DA)

- A Floor Mounted Bar Grille with Screen
- E Ceiling Mounted Front Discharge with Duct Collar
- F Ceiling Mounted Front Disch. with Dbl. Defl. Grille
- G Ceiling Mounted Down Disch. with Dbl. Defl. Grille

#### 10 - Cooling Option (CO)

- 0 None
- 2 2-Row Chilled Water/Hot Water 2-Pipe
- 4 4-Row Chilled Water/Hot Water 2-Pipe
- 5 Direct Expansion (DX) Cooling Only

#### 11 - Heating Option (HO)

- 0 Hot Water/Chilled Water 2-Pipe
- 1 1-Row Hot Water Coil
- 2 2-Row Hot Water Coil
- 3 Steam Coil (1-Row)
- N None

#### 12 - Coil Access (CA)

- A Right Hand Coil(s)
- B Left Hand Coil(s)
- C RH Cooling, LH Heating
- D LH Cooling, RH Heating

#### 13 - Coil Positions (CP)

- 0 Units with One Coil
- 1 Preheat: Pos 1 Heating, Pos 2 Cooling
- 2 Reheat: Pos 1 Cooling, Pos 2 Heating

#### 14 - Outside Air Damper Assembly (OA)

- C Insulated Damper
- E No Damper (Recirculating Unit)

#### 15 - Supply Voltage (SV)

- A 115/60/1 C - 230/60/1
- B 208/60/1 H - 277/60/1

#### 16 - Motor Type (MT)

- 2 High Static, EC Motor (3SS)
- 3 High Static, EC Motor, 0-10vDC
- 4 Standard EC Motor (3SS)
- 5 Standard EC Motor, 0-10vDC (Standard EC for Floor Mounted units only without external static.)
- 17 Electrical Connection (EC)
  - A Left Hand Side
  - B Right Hand Side

#### 18 - Control (C)

- A By Others, Field Installed
- B Factory DDC
- C Modine Controls System
- D Free Issue

#### 19 - Design Generation (DG)

- 1 First Generation
- 2 Second Generation (R-454B DX)

#### 20 - Filters (FL)

- A 70-75% Arrestance (Standard)
- B MERV 10
- C MFRV 13

#### 21 - Cooling Pipe Package (PC) (Floor Mounted Unit Only)

- D 2-Way Valve, All Components
- H 3-Way Valve, All Components
- N None

#### 22 -Heating Pipe Package (PH) (Floor Mounted Unit Only)

- D 2-Way Valve, All Components
- H 3-Way Valve, All Components
- N None

#### Figure 46.1 - Serial Plate Example



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As Modine Manufacturing Company has a continuous product improvement program, it reserves the right to change design and specifications without notice.



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