Appendix E

Noise Data

Construction Source Noise Prediction Model

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Residences to the East	150	75.1
Residences to the South	750	61.1

Equipment	Reference Noise Levels (L_{eq}) at 50 feet[1]	Usage Factor[1]
Dozer	85	0.4
Front End Loader	80	0.4
Excavator	85	0.4

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level	L_{eq} dBA at 50 feet[3]
Dozer	81.0
Front End Loader	76.0
Excavator	81.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
84.7

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006. Table 1.

[2] Based on Table 4-26 from the Federal Transit Noise and Vibration Impact Assessment, 2018 (pg 86).

[3] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2018 (pg 176 and 177).

L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50)

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects (FTA 2018: pg 86); and

D = Distance from source to receiver.

Construction Source Noise Prediction Model

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{max} dBA)
Residences to the East	150	79.1
Residences to the South	750	65.1

Equipment	Reference Emission Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Dozer	85	1
Front End Loader	80	1
Excavator	85	1

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level	L_{eq} dBA at 50 feet[3]
Dozer	85.0
Front End Loader	80.0
Excavator	85.0

Combined Predicted Noise Level (L_{max} dBA at 50 feet)
88.6

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006. Table 1.

[2] Based on Table 4-26 from the Federal Transit Noise and Vibration Impact Assessment, 2018 (pg 86).

[3] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2018 (pg 176 and 177).

L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50)

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects (FTA 2018: pg 86); and

D = Distance from source to receiver.

This sheet used to calculate HVAC Leq from Lmax

Location	Distance to Nearest Receptor in feet	Combined Predicted Noise Level (L_{eq} dBA)
Residences to the west	1100	48.1
Phoenix Sacramento	1800	43.9

Equipment	Reference Noise Levels (L_{max}) at 50 feet[1]	Usage Factor[1]
Dozer	78	0.5

Ground Type	hard
Source Height	8
Receiver Height	5
Ground Factor[2]	0.00

Predicted Noise Level	L_{eq} dBA at 50 feet[3]
Dozer	75.0

Combined Predicted Noise Level (L_{eq} dBA at 50 feet)
75.0

Sources:

[1] Obtained from the FHWA Roadway Construction Noise Model, January 2006. Table 1.

[2] Based on Table 4-26 from the Federal Transit Noise and Vibration Impact Assessment, 2018 (pg 86).

[3] Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2018 (pg 176 and 177).

L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50)

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects (FTA 2018: pg 86); and

D = Distance from source to receiver.

Equipment Description	Acoustical Usage Factor (%)	Spec 721.560 Lmax @ 50ft (dBA slow)	Actual Measured Lmax @ 50ft (dBA slow)	No. of Actual Data Samples (count)	Spec 721.560 LmaxCalc	Spec 721.560 Leq	Distance	Actual Measured LmaxCalc	Actual Measured Leq
Auger Drill Rig	20	85	84	36	79.0	72.0	100	78.0	71.0
Backhoe	40	80	78	372	74.0	70.0	100	72.0	68.0
Bar Bender	20	80	na	0	74.0	67.0	100		
Blasting	na	94	na	0	88.0		100		
Boring Jack Power Unit	50	80	83	1	74.0	71.0	100	77.0	74.0
Chain Saw	20	85	84	46	79.0	72.0	100	78.0	71.0
Clam Shovel (dropping)	20	93	87	4	87.0	80.0	100	81.0	74.0
Compactor (ground)	20	80	83	57	74.0	67.0	100	77.0	70.0
Compressor (air)	40	80	78	18	74.0	70.0	100	72.0	68.0
Concrete Batch Plant	15	83	na	0	77.0	68.7	100		
Concrete Mixer Truck	40	85	79	40	79.0	75.0	100	73.0	69.0
Concrete Pump Truck	20	82	81	30	76.0	69.0	100	75.0	68.0
Concrete Saw	20	90	90	55	84.0	77.0	100	84.0	77.0
Crane	16	85	81	405	79.0	71.0	100	75.0	67.0
Dozer	40	85	82	55	79.0	75.0	100	76.0	72.0
Drill Rig Truck	20	84	79	22	78.0	71.0	100	73.0	66.0
Drum Mixer	50	80	80	1	74.0	71.0	100	74.0	71.0
Dump Truck	40	84	76	31	78.0	74.0	100	70.0	66.0
Excavator	40	85	81	170	79.0	75.0	100	75.0	71.0
Flat Bed Truck	40	84	74	4	78.0	74.0	100	68.0	64.0
Front End Loader	40	80	79	96	74.0	70.0	100	73.0	69.0
Generator	50	82	81	19	76.0	73.0	100	75.0	72.0
Generator (<25KVA, VMS s	50	70	73	74	64.0	61.0	100	67.0	64.0
Gradall	40	85	83	70	79.0	75.0	100	77.0	73.0
Grader	40	85	na	0	79.0	75.0	100		
Grapple (on Backhoe)	40	85	87	1	79.0	75.0	100	81.0	77.0
Horizontal Boring Hydr. Jac	25	80	82	6	74.0	68.0	100	76.0	70.0
Hydra Break Ram	10	90	na	0	84.0	74.0	100		
Impact Pile Driver	20	95	101	11	89.0	82.0	100	95.0	88.0
Jackhammer	20	85	89	133	79.0	72.0	100	83.0	76.0
Man Lift	20	85	75	23	79.0	72.0	100	69.0	62.0
Mounted Impact Hammer	20	90	90	212	84.0	77.0	100	84.0	77.0
Pavement Scarafier	20	85	90	2	79.0	72.0	100	84.0	77.0
Paver	50	85	77	9	79.0	76.0	100	71.0	68.0
Pickup Truck	40	55	75	1	49.0	45.0	100	69.0	65.0
Pneumatic Tools	50	85	85	90	79.0	76.0	100	79.0	76.0
Pumps	50	77	81	17	71.0	68.0	100	75.0	72.0
Refrigerator Unit	100	82	73	3	76.0	76.0	100	67.0	67.0
Rivit Buster/chipping gun	20	85	79	19	79.0	72.0	100	73.0	66.0
Rock Drill	20	85	81	3	79.0	72.0	100	75.0	68.0
Roller	20	85	80	16	79.0	72.0	100	74.0	67.0
Sand Blasting (Single Nozzl	20	85	96	9	79.0	72.0	100	90.0	83.0
Scraper	40	85	84	12	79.0	75.0	100	78.0	74.0
Shears (on backhoe)	40	85	96	5	79.0	75.0	100	90.0	86.0
Slurry Plant	100	78	78	1	72.0	72.0	100	72.0	72.0
Slurry Trenching Machine	50	82	80	75	76.0	73.0	100	74.0	71.0
Soil Mix Drill Rig	50	80	na	0	74.0	71.0	100		
Tractor	40	84	na	0	78.0	74.0	100		
Vacuum Excavator (Vac-tru	40	85	85	149	79.0	75.0	100	79.0	75.0
Vacuum Street Sweeper	10	80	82	19	74.0	64.0	100	76.0	66.0
Ventilation Fan	100	85	79	13	79.0	79.0	100	73.0	73.0
Vibrating Hopper	50	85	87	1	79.0	76.0	100	81.0	78.0
Vibratory Concrete Mixer	20	80	80	1	74.0	67.0	100	74.0	67.0
Vibratory Pile Driver	20	95	101	44	89.0	82.0	100	95.0	88.0
Warning Horn	5	85	83	12	79.0	66.0	100	77.0	64.0
Welder / Torch	40	73	74	5	67.0	63.0	100	68.0	64.0

Source:
FHWA Roadway Construction Noise Model, January 2006. Table 9.1
U.S. Department of Transportation
CA/T Construction Spec. 721.560

Traffic Noise Spreadsheet Calculator
Existing Conditions

Project: Roseville Industrial Park

Noise Level Descriptor: CNEL
Site Conditions: Hard
Traffic Input: ADT
Traffic K-Factor:

		Segment Description and Location		Input										Output				
						Distance to Directional Centerline, (feet)[4]		Traffic Distribution Characteristics						CNEL,	Distance to Contour, (feet)[3]			
Number	Name	From	To	ADT	Speed (mph)	Near	Far	% Auto	% Medium	% Heavy	% Day	% Eve	% Night	(dBA)[5,6,7]	75 dBA	70 dBA	65 dBA	60 dBA
ID																		
1	Phillip Road	From Project Site	Westbrook Boulevard	300	35	103	109	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	46.2			1	4
2	Blue Oaks Blvd	Westbrook Boulevard	North Hayden Parkway	5,200	45	109	130	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	61.2	5	16	50	157
3	Blue Oaks Blvd	North Hayden Parkway	Fiddyment Road	6,400	45	109	130	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	62.1	6	19	61	193
4	Westbrook Blvd	Blue Oaks Boulevard	Pleasant Grove Boulevar	6,100	40	113	130	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	60.3	4	13	41	131
5	Pleasant Grove Blvd	Westbrook Boulevard	Market Street	9,400	45	109	165	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	63.3	9	29	91	289
6	Pleasant Grove Blvd	Market Street	Fiddyment Road	16,000	45	109	165	97.5%	1.5%	1.0%	85.0%	7.5%	7.5%	65.6	16	49	156	492

Traffic Noise Spreadsheet Calculator
Existing Plus Project Conditions

Project: Roseville Industrial Park

Noise Level Descriptor: CNEL
Site Conditions: Hard
Traffic Input: ADT
Traffic K-Factor:

	Segment Description and Location			Input										Output				
						Distance to Directional Centerline, (feet)[4]		Traffic Distribution Characteristics						CNEL,	Distance to Contour, (feet)[3]			
Number	Name	From	To	ADT	Speed (mph)	Near	Far	% Auto	% Medium	% Heavy	% Day	% Eve	% Night	(dBA)[5,6,7]	70 dBA	65 dBA	60 dBA	55 dBA
ID																		
1	Phillip Road	From Project Site	Westbrook Boulevard	8,460	35	103	109	86.0%	13.0%	1.0%	85.0%	7.5%	7.5%	62.6	19	61	194	614
2	Blue Oaks Blvd	Westbrook Boulevard	North Hayden Parkway	10,100	45	109	130	86.0%	13.0%	1.0%	85.0%	7.5%	7.5%	65.5	43	135	425	1345
3	Blue Oaks Blvd	North Hayden Parkway	Fiddyment Road	11,210	45	109	130	86.0%	13.0%	1.0%	85.0%	7.5%	7.5%	66.0	47	149	472	1493
4	Westbrook Blvd	Blue Oaks Boulevard	Pleasant Grove Boulev	9,120	40	113	130	86.0%	13.0%	1.0%	85.0%	7.5%	7.5%	63.7	29	90	286	903
5	Pleasant Grove Blvd	Westbrook Boulevard	Market Street	12,260	45	109	165	86.0%	13.0%	1.0%	85.0%	7.5%	7.5%	65.9	53	166	525	1662
6	Pleasant Grove Blvd	Market Street	Fiddyment Road	18,860	45	109	165	86.0%	13.0%	1.0%	85.0%	7.5%	7.5%	67.8	81	256	808	2556

Increase in Noise

#	Segment	From	To	Exist	Plus Project	Change
1	Phillip Road	From Project Site	estbrook Bouleva	46.2	62.6	16.4
2	Blue Oaks Blvd	Westbrook Boulevard	rth Hayden Parkw	61.2	65.5	4.3
3	Blue Oaks Blvd	North Hayden Parkway	Fiddyment Road	62.1	66.0	3.9
4	Westbrook Blvd	Blue Oaks Boulevard	sant Grove Boule	60.3	63.7	3.4
5	leasant Grove Blv	Westbrook Boulevard	Market Street	63.3	65.9	2.6
6	leasant Grove Blv	Market Street	Fiddyment Road	65.6	67.8	2.2

Raw Traffic Data

	Street	From	to	speed limit	Existing ADT	Existing + Project ADT
1	Phillip Road	From Project Site	Westbrook Boulevard	35	300	8,460
2	Blue Oaks Blvd	Westbrook Boulevard	North Hayden Parkway	45	5,200	10,100
3	Blue Oaks Blvd	North Hayden Parkway	Fiddyment Road	45	6,400	11,210
4	Blue Oaks Blvd	Fiddyment Road	Del Webb Blvd		N/A	N/A
5	Westbrook Blvd	Blue Oaks Boulevard	Pleasant Grove Boulevard	40	6,100	9,120
6	Westbrook Blvd	Pleasant Grove Boulevard	Earl Rush Drive		N/A	N/A
7	Pleasant Grove Blvd	Santucci Boulevard	Westbrook Boulevard		N/A	N/A
8	Pleasant Grove Blvd	Westbrook Boulevard	Market Street	45	9,400	12,260
9	Pleasant Grove Blvd	Market Street	Fiddyment Road	45	16,000	18,860
10	Fiddyment Rd	North Hayden Parkway	Blue Oaks Boulevard		N/A	N/A
11	Fiddyment Rd	Blue Oaks Boulevard	North Hayden Parkway		N/A	N/A
12	Fiddyment Rd	North Hayden Parkway	Pleasant Grove Boulevard		N/A	N/A
13	Fiddyment Rd	Pleasant Grove Boulevard	Baseline Road		N/A	N/A
14						
15						
16						
17						Fiddyment Road
18			North Hayden Parkway			
19						
20						
21						
22						Westbrook Boulevard
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40						

Notes

1. Segments and PM peak hour volumes derived from Figures 4A, 4B, 11A, and 11B in the Traffic Impact Study prepared by Fehr and Peers (2019)
2. ADT volumes were derived by applying a k-factor of 10 to the peak hour volumes.

Citation #	Citations	
1	Caltrans Technical Noise Supplement. 2009 (November). Table (5-11), Pg 5-60.	Caltrans Technical Noise Supplement. 2013 (September). Table (4-2), Pg 4-17.
2	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-26), Pg 5-60.	Caltrans Technical Noise Supplement. 2013 (September). Equation (4-5), Pg 4-17.
3	Caltrans Technical Noise Supplement. 2009 (November). Equation (2-16), Pg 2-32.	FHWA 2004 TNM Version 2.5
4	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-11), Pg 5-47, 48.	FHWA 2004 TNM Version 2.5
5	Caltrans Technical Noise Supplement. 2009 (November). Equation (2-26), Pg 2-55, 56.	Caltrans Technical Noise Supplement. 2013 (September). Equation (2-23), Pg 2-51, 52.
6	Caltrans Technical Noise Supplement. 2009 (November). Equation (2-27), Pg 2-57.	Caltrans Technical Noise Supplement. 2013 (September). Equation (2-24), Pg 2-53.
7	Caltrans Technical Noise Supplement. 2009 (November). Pg 2-53.	Caltrans Technical Noise Supplement. 2013 (September). Pg 2-57.
8	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-7), Pg 5-45.	FHWA 2004 TNM Version 2.5
9	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-8), Pg 5-45.	FHWA 2004 TNM Version 2.5
10	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-9), Pg 5-45.	FHWA 2004 TNM Version 2.5
11	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-13), Pg 5-49.	FHWA 2004 TNM Version 2.5
12	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-14), Pg 5-49.	FHWA 2004 TNM Version 2.5
13	Federal Highway Administration Traffic Noise Model Technical Manual. Report No. FHWA-PD-96-010. 1998 (January). Equation (16), Pg 67	
14	Federal Highway Administration Traffic Noise Model Technical Manual. Report No. FHWA-PD-96-010. 1998 (January). Equation (20), Pg 69	
15	Federal Highway Administration Traffic Noise Model Technical Manual. Report No. FHWA-PD-96-010. 1998 (January). Equation (18), Pg 69	

References

California Department of Transportation (Caltrans). 2009 (November). Technical Noise Supplement. Available: http://www.dot.ca.gov/hq/env/noise/pub/tens_complete.pdf. Accessed August 17, 2017.

California Department of Transportation (Caltrans). 2013 (September). Technical Noise Supplement. Available: http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013A.pdf. Accessed August 17, 2017.

Federal Highway Administration. 2004. Traffic Noise Model Version 2.5. Available: https://www.fhwa.dot.gov/environment/noise/traffic_noise_model/tnm_v25/. Accessed August 17, 2017.

Attenuation Calculations for Stationary Noise Sources

KEY: Orange cells are for input.
Grey cells are intermediate calculations performed by the model.
Green cells are data to present in a written analysis (output).

STEP 1: Identify the noise source and enter the reference noise level (dBA and distance).

STEP 2: Select the ground type (hard or soft), and enter the source and receiver heights.

STEP 3: Select the distance to the receiver.

Noise Source/ID	Reference Noise Level			Attenuation Characteristics				Attenuated Noise Level at Receptor		
	noise level (dBA)	@	distance (ft)	Ground Type (soft/hard)	Source Height (ft)	Receiver Height (ft)	Ground Factor	noise level (dBA)	@	distance (ft)
Loading Dock Activity Leq	84.0	@	50	hard	12	5	0.00	74.5	@	150
Loading Dock Activity Lmax	86.0	@	50	hard	12	5	0.00	76.5	@	150
HVAC lmax	78.0	@	3	hard	4	5	0.00	44.0	@	150
HVAC leq	75.0	@	3	hard	4	5	0.00	41.0	@	150
HVAC lmax	78.0	@	3	hard	4	5	0.00	30.0	@	750
HVAC leq	75.0	@	3	hard	4	5	0.00	27.0	@	750
Truck releasing air brakes	86.0	@	50	hard	4	5	0.00	76.5	@	150
Truck releasing air brakes	86.0	@	50	hard	4	5	0.00	62.5	@	750
Truck releasing air brakes (night)	86.0	@	50	hard	4	5	0.00	72.0	@	250
Truck (mitigation-10db)	76.0	@	50	hard	4	5	0.00	66.5		150
Diesel Generator (day)	82.0	@	50	hard	4	5	0.00	56.9	@	900
Diesel Generator (night)	82.0	@	50	hard	4	5	0.00	51.9	@	1600
Diesel Generator	82.0	@	50	hard	4	5	0.00	72.5	@	150
Diesel Generator	82.0	@	50	hard	4	5	0.00	58.5	@	750
Generator (mitigation 10 db)	72.0	@	50	hard	4	5	0.00	62.5	@	150

Notes:

Estimates of attenuated noise levels do not account for reductions from intervening barriers, including walls, trees, vegetation, or structures of any type.

Computation of the attenuated noise level is based on the equation presented on pg. 12-3 and 12-4 of FTA 2006.

Computation of the ground factor is based on the equation presentd in Figure 6-23 on pg. 6-23 of FTA 2006, where the distance of the reference noise leve can be adjusted and the usage factor is not applied (i.e., the usage factor is equal to 1).

Sources:

Federal Transit Association (FTA). 2006 (May). Transit Noise and Vibration Impact Assessment. FTA-VA-90-1003-06. Washington, D.C. Available: <http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf>. Accessed: September 24, 2010.

AIR CONDITIONERS

16ACX

MERIT® Series

R-410A - Two-Stage Compressor

PRODUCT SPECIFICATIONS

Bulletin No. 210873
March 2019
Supersedes February 2019

MERIT® SERIES

ENERGY STAR

SEER up to 17.00
2 to 5 Tons
Cooling Capacity - 23,200 to 58,500 Btuh

MODEL NUMBER INDENTIFICATION

16 AC X – 036 - 230 A 01

- **Nominal SEER**
- **Unit Type**
  AC = Air Conditioner
- **Refrigerant**
  X = R-410A
- **Regional Standards**
  – (dash) = All Regions
- **Nominal Cooling Capacity**
  024 = 2 tons
  036 = 3 tons
  048 = 4 tons
  060 = 5 tons
- **Voltage**
  230 = 208/230V-1phase-60hz
- **Ratings Revision Level**
- **Minor Revision Level**

CONTENTS

WARRANTY

Compressor - limited warranty for five years in residential installations and five years in non-residential installations.

All other covered components - five years in residential installations and one year in non-residential installations.

Refer to Lennox Equipment Limited Warranty certificate included with unit for specific details.

APPROVALS

AHRI Certified to AHRI Standard 210/240.

For AHRI Certified system match-ups and expanded ratings, visit www.LennoxPROs.com.

Sound rated in Lennox reverberant sound test room in accordance with test conditions included in AHRI Standard 270-2008.

Tested in the Lennox Research Laboratory environmental test room.

Rated according to U.S. Department of Energy (DOE) test procedures.

Region specific models meet the minimum efficiency requirements for U.S DOE Federal Regional Standards in that area.

Air conditioners and components within bonded for grounding to meet safety standards for servicing required by UL and CEC.

Units are ETL certified for the U.S. and Canada.

ISO 9001 Registered Manufacturing Quality System.

Certain ENERGY STAR® certified units are designed to use less energy, help save money on utility bills, and help protect the environment.

APPLICATIONS

2 through 5 ton.

Sound levels as low as 76 dB.

Single phase power supply.

Vertical air discharge allows concealment behind shrubs at grade level or out of sight on a roof.

Matching add-on furnace indoor coils or air handlers provide a wide range of cooling capacities and applications.

See Indoor Coils and Air Handlers for data.

Units shipped completely factory assembled, piped, and wired. Each unit is test operated at the factory insuring proper operation.

Installer must set air conditioner, connect refrigerant lines, and make electrical connections to complete job.

REFRIGERATION SYSTEM

R-410A Refrigerant
Non-chlorine, ozone friendly, R-410A.
Unit pre-charged with refrigerant.
See Specification table.

Outdoor Coil Fan
Direct drive fan moves large air volumes uniformly through entire condenser coil for high refrigerant cooling capacity.

Vertical air discharge minimizes operating sounds and eliminates damage to lawn and shrubs.

Fan motor has sleeve bearings and is inherently protected.

Motor totally enclosed for maximum protection from weather, dust and corrosion

Louvered steel top fan guard furnished as standard.

Fan service access accomplished by removal of the top panel.

Copper Tube/Enhanced Fin Coil
Lennox designed and fabricated coil.

Ripple-edged aluminum fins.

Copper tube construction.

Lanced fins provide maximum exposure of fin surface to air stream resulting in excellent heat transfer.

Fin collars grip tubing for maximum contact area. Flared shoulder tubing connections/silver soldering construction.

Coil is factory tested under high pressure to insure leakproof construction.

Entire coil is accessible for cleaning.

High Pressure Switch
Shuts off unit if abnormal operating conditions cause the discharge pressure to rise above setting.
Protects compressor from excessive condensing pressure.

Auto-reset.

Low Pressure Switch
Shuts off unit if suction pressure falls below setting.
Provides loss of charge and freeze-up protection.
Auto-reset.

REFRIGERATION SYSTEM (continued)

Hi-Capacity Liquid Line Drier
Furnished for field installation.

Approved for use with R-410A systems.

Traps any moisture or dirt that could contaminate the system.

Optional Accessories

Expansion Valve Kits
Must be ordered extra and field installed on certain indoor units. See TXV Usage table.

Chatleff style fitting.

Freezestat
Installs on or near the discharge line of the indoor coil or on the suction line.

Senses suction line temperature and cycles the compressor off when suction line temperature falls below it's setpoint.

Opens at 29°F and closes at 58°F.

Refrigerant Line Kits
Refrigerant lines (suction & liquid) are shipped refrigeration clean. Lines are cleaned, dried, pressurized, and sealed at factory.

Suction line fully insulated.

L15 lines are stubbed at both ends.

See Specifications table for selection.

Not available for -060 model and must be field fabricated.

COMPRESSOR

Two-Stage Compressor
Compressor features high efficiency with uniform suction flow, constant discharge flow, high volumetric efficiency and quiet operation.

Compressor consists of two involute spiral scrolls matched together to generate a series of crescent shaped gas pockets between them.

During compression, one scroll remains stationary while the other scroll orbits around it.

Gas is drawn into the outer pocket, the pocket is sealed as the scroll rotates.

As the spiral movement continues, gas pockets are pushed to the center of the scrolls. Volume between the pockets is simultaneously reduced.

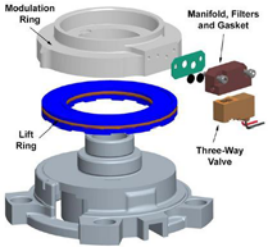
When the pocket reaches the center, gas is now at high pressure and is forced out of a port located in the center of the fixed scrolls. During compression, several pockets are compressed simultaneously resulting in a smooth continuous compression cycle.

Continuous flank contact, maintained by centrifugal force, minimizes gas leakage and maximizes efficiency.

Scroll compressor is tolerant to the effects of slugging and contaminants. If this occurs, scrolls separate, allowing liquid or contaminants to to be worked toward the center and discharged.

During the compression process, there are several pockets in the scroll that are compressing gas. Modulation is achieved by venting a portion of the gas in the first suction pocket back to the low side of the compressor thereby reducing the effective displacement of the compressor.

A 24-volt DC solenoid valve inside the compressor controls staging. When the 3-way solenoid is energized it moves the lift ring assembly to block the ports and the compressor operates at full-load or 100% capacity. When the solenoid is de-energized the lift ring assembly moves to unblock the compressor ports and the compressor operates at part-load or approximately 67% of its full-load capacity.



The "loading" and "unloading" of the two stage scroll is done "on the fly" without shutting off the single-speed compressor motor between stages.

Low gas pulses during compression reduces operational sound levels.

Compressor motor is internally protected from excessive current and temperature.

Compressor is installed in the unit on specially formulated, resilient rubber mounts for better sound dampening and vibration free operation.

Crankcase Heater (048-060 models only)
Crankcase heater prevents migration of liquid refrigerant into compressor and ensures proper compressor lubrication.

Optional Accessories

Crankcase Heater (Optional for 024-036 models)
Crankcase heater prevents migration of liquid refrigerant into compressor and ensures proper compressor lubrication.

Compressor Hard Start Kit
Single-phase units are equipped with a PSC compressor motor. This type of motor normally does not need a potential relay and start capacitor.

In conditions such as low voltage, kit may be required to increase the compressor starting torque.

Hard start kit is required in applications where the supply voltage is less than 230V.

COMPRESSOR (continued)

Optional Accessories (continued)

Compressor Sound Cover
A reinforced vinyl compressor cover containing a 1-1/2 inch thick batt of fiberglass insulation.

All open edges are sealed with a one-inch wide hook and loop fastening tape.

CONTROLS

Optional Accessories

iComfort® M30 Smart Wi-Fi Thermostat
Wi-Fi-enabled, electronic 7-day, universal, multi-stage, programmable, touchscreen thermostat.

4 Heat/2 Cool.

Auto-changeover.

Dual-fuel control with optional outdoor sensor.

Controls dehumidification during cooling mode and humidification during heating mode.

Offers enhanced capabilities including humidification / dehumidification / dewpoint measurement and control, *Humiditrol*® control, and equipment maintenance reminders.

Easy to read 4.3 in. color touchscreen (measured diagonally).

LCD display with backlight shows the current and set temperature, time, inside relative humidity, system status (operating mode and schedules) and outside temperature (optional outdoor sensor required).

Smooth Setback Recovery starts system early to achieve setpoint at start of program period.

Compressor short-cycle protection (5 minutes).

Up to four separate schedules are available plus Schedule IQ™.

One-Touch Away Mode - A quick and easy way to set the cooling and heating setpoints while away.

Smart Away™ - Uses geo-fencing technology to determine when the homeowner is within a predetermined distance from the home to operate the system when leaving, away and arriving.

Amazon® Alexa-enabled, smart-home-compatible. It works with Amazon Echo, Echo Dot and Tap devices.

Wi-Fi remote monitoring and adjustment through a home wireless network for desktop PCs, laptops and apps for smartphones or tablets.

See the iComfort® M30 Smart Wi-Fi Thermostat Product Specifications bulletin in the Controls section for more information.

Remote Outdoor Temperature Sensor
Used with the iComfort® M30 Smart Thermostat.

When installed outdoors, sensor allows thermostat to display outdoor temperature. Sensor is auto-detected when connected to thermostat.

NOTE - Sensor is required for the Enhanced Dehumidification Accessory (EDA).

Thermostat
Thermostat (programmable/non-programmable) is not furnished with unit.

See Thermostat bulletins in Controls Section and Lennox Price Book for selection.

Blower Relay Kit (for use with furnaces equipped with constant torque blower motors)
Allows furnace blower speed changes when matched with two-stage air conditioners.

Indoor Blower Off Delay Relay
Delays the indoor blower-off time during the cooling cycle.

Indoor Blower Speed Relay
Relay kit provides the option of changing blower speeds on standard permanent split capacitor (PSC) multi-tap blower motors during cooling operation.

Provides optimum humidity control conditions by automatically reducing indoor blower speed during continuous fan operation or low stage compressor operation to reduce humidity levels.

Low Ambient Kit
Air conditioner will operate satisfactorily down to 45°F outdoor air temperature without any additional controls.

Kit can be added in the field enabling unit to operate properly down to 30°F.

A Freezestat and should be installed on compressors equipped with a Low Ambient Kit.

A Compressor Low Ambient Cut-Off Switch should be added to terminate compressor operation below recommended operation conditions.

FEATURES

CABINET

Heavy gauge steel cabinet with five station metal wash process.

Louvered heavy gauge steel panels surround unit on all four sides to prevent damage to the coil.

Powder paint finish provides superior rust and corrosion protection.

Control box is conveniently located with all controls factory wired.

Corner patch plate allows access to compressor components.

Drainage holes are provided in base section for moisture removal.

PermaGuard™ Unit Base
Durable zinc-coated base section resists rust and corrosion.

Refrigerant Line Connections, Electrical Inlets and Service Valves
Sweat connection suction and liquid lines are located on corner of unit cabinet.

Fully serviceable brass service valves prevent corrosion and provide access to refrigerant system. Suction valve can be fully shut off, while liquid valve may be front seated to manage refrigerant charge while servicing system.

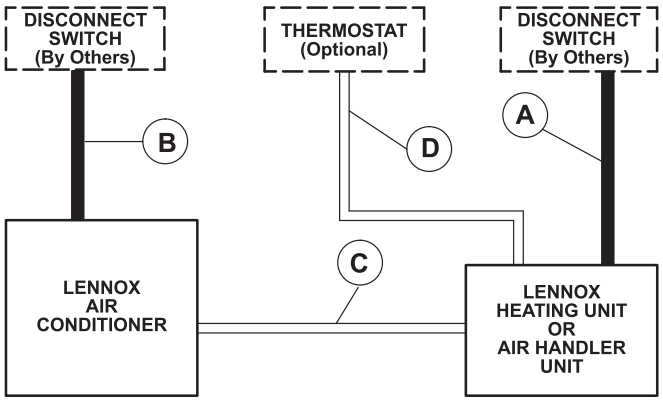
Refrigerant line connections and field wiring inlets are located in one central area of the cabinet. See dimension drawing.

Optional Accessories

Unit Stand-Off Kit
Black high density polyethylene feet are available to raise unit off of mounting surface away from damaging moisture.

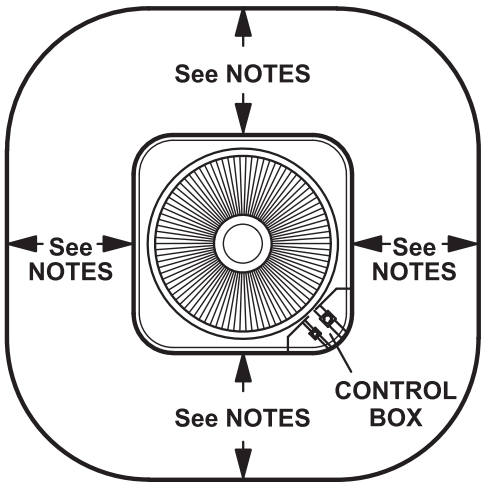
Four feet are furnished per order number.

FIELD WIRING



A - Two Wire Power
B - Two Wire Power (See Electrical Data)
C - Four Wire Low Voltage (18 ga. minimum)
D - Five Wire Low Voltage (18 ga. minimum)
NOTE - Field Wiring Not Furnished
All wiring must conform to NEC or CEC and local electrical codes.

INSTALLATION CLEARANCES



NOTES:
Service clearance of 30 in. (762 mm) must be maintained on one of the sides adjacent to the control box.
Clearance to one of the other three sides must be 36 in. (914 mm)
Clearance to one of the remaining two sides may be 12 in. (305 mm) and the final side may be 6 in. (152 mm).
A clearance of 24 in. must be maintained between two units.
48 in. (1219 mm) clearance required on top of unit.

SPECIFICATIONS

General Data	Model No.	All Regions	16ACX-024	16ACX-036	16ACX-048	16ACX-060
		Nominal Tonnage	2	3	4	5
[1] Sound Rating Number (dB)			77	76	78	75
Connections (sweat)		Liquid line (o.d.) - in.	3/8	3/8	3/8	3/8
		Suction line (o.d.) - in.	3/4	7/8	7/8	1-1/8
Refrigerant		[2] R-410A charge furnished	7 lbs. 2 oz.	9 lbs. 0 oz.	10 lbs. 6 oz.	13 lbs. 2 oz.
Outdoor Coil	Net face area - sq. ft.	Outer coil	24.50	16.33	21.00	29.09
		Inner coil	- - -	15.76	20.27	28.24
	Tube diameter - in. and No. of rows		5/16 - 1	5/16 - 2	5/16 - 2	5/16 - 2
		Fins per inch	26	22	22	22
Outdoor Fan	Diameter - in. and No. of blades		22 - 3	22 - 3	22 - 3	26 - 3
		Motor hp	1/6	1/4	1/4	1/4
		Cfm	3260	3450	3800	4375
		Rpm	825	825	825	825
		Watts	220	290	305	270
Shipping Data - lbs. 1 pkg.			190	190	235	285

ELECTRICAL DATA

Line voltage data - 60hz			[5] 230V-1ph	[5] 230V-1ph	[5] 230V-1ph	[5] 230V-1ph
[3] Maximum overcurrent protection (amps)			20	30	40	50
[4] Minimum circuit ampacity			15.6	20.8	29.2	35.7
Compressor		Rated load amps	10.2	14.2	17	23.5
		Locked rotor amps	55	78	109	118
		Power factor	0.98	0.95	0.97	0.95
Outdoor Fan Motor		Full load amps	1.0	1.7	1.7	1.4
		Locked Rotor amps	1.9	3.2	3.2	3.2

CONTROLS - ORDER SEPARATELY

iComfort® M30 Smart Wi-Fi Thermostat		15Z69	•	•	•	•
Remote Outdoor Temperature Sensor		X2658	•	•	•	•

OPTIONAL ACCESSORIES - ORDER SEPARATELY

Blower Relay Kit (for constant torque gas furnaces)		85W66	•	•	•	•
Compressor Crankcase Heater		93M04	•	•	Factory	Factory
[5] Compressor Hard Start Kit - Required in applications with less than 230V		63W22	•			
		10J42		•	•	
		63W24				•
Compressor Low Ambient Cut-Off		45F08	•	•	•	•
Compressor Sound Cover		27W55	•	•		
		27W56			•	•
Compressor Time-Off Control		47J27	•	•	•	•
Freezestat	3/8 in. tubing	93G35	•	•	•	•
	5/8 in. tubing	50A93	•	•	•	•
Indoor Blower Off Delay Relay		58M81	•	•	•	•
Indoor Blower Speed Relay Kit		40K58	•	•	•	•
[6] Low Ambient Kit (Fan Cycling)		34M72	•	•	•	•
Refrigerant Line Sets	L15-41-20 L15-41-30	L15-41-40 L15-41-50	•			
	L15-65-30	L15-65-40 L15-65-50		•	•	
		Field Fabricate				•
Unit Stand-Off Kit		94J45	•	•	•	•

NOTE - Extremes of operating range are plus 10% and minus 5% of line voltage.

[1] Sound Rating Number in accordance with test conditions included in AHRI Standard 270.

[2] Refrigerant charge sufficient for 15 ft. length of refrigerant lines. For longer line set requirements see the Installation Instructions for information about line set length and additional refrigerant charge required.

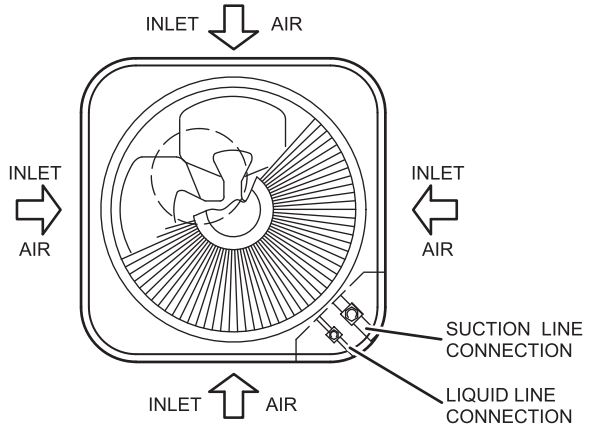
[3] HACR type breaker or fuse.

[4] Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

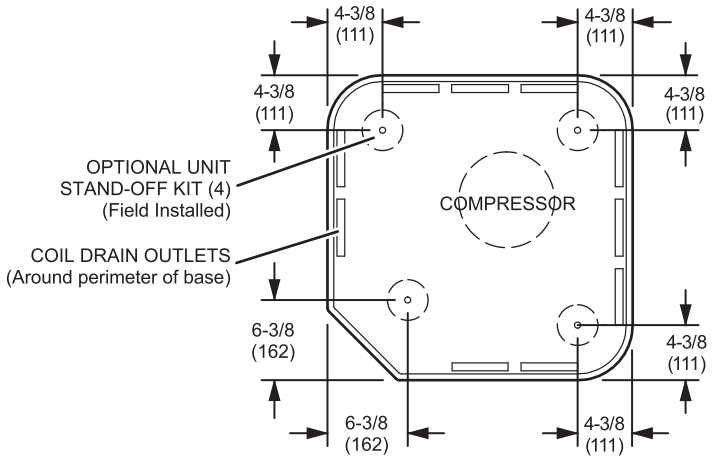
[5] Hard Start Kit is required in applications where the supply voltage is less than 230V.

[6] Freezestat is recommended with Low Ambient Kit.

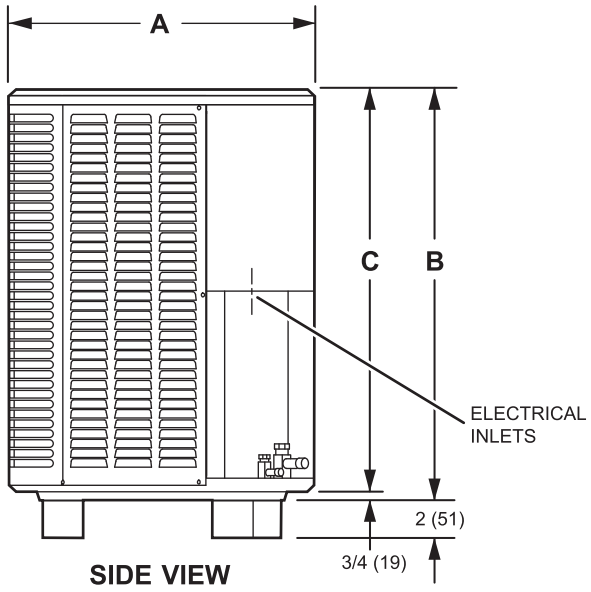
DIMENSIONS



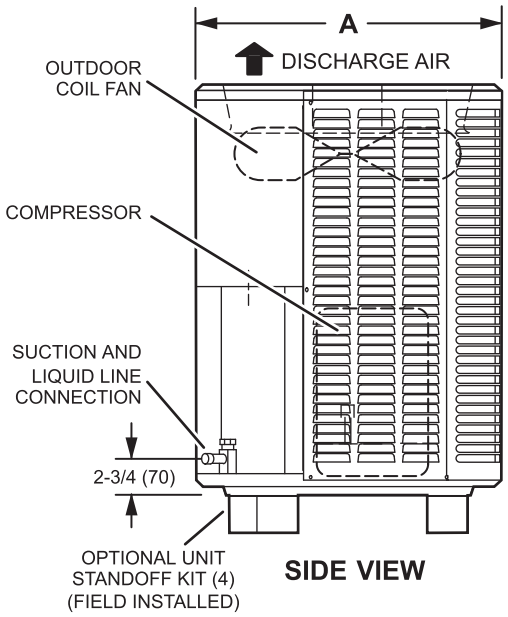
TOP VIEW



TOP VIEW BASE SECTION



SIDE VIEW



SIDE VIEW

Model	A		B		C	
	inches	mm	inches	mm	inches	mm
16ACX-024	28-1/4	718	43-1/4	1099	42-1/4	1073
16ACX-036	28-1/4	718	29-1/4	743	28-1/2	724
16ACX-048	28-1/4	718	37-1/4	946	36-1/2	927
16ACX-060	32-1/4	819	43-1/4	1099	42-1/4	1073

SOUND DATA

[1] Unit Model	Octave Band Linear Sound Power Levels dB, re 10^{-12} Watts Center Frequency - HZ							[1] Sound Rating Number (dB)	[2] Estimated Sound Pressure Level at Distance From Unit (dB at distance in ft.)				
	125	250	500	1000	2000	4000	8000		3	5	10	15	50
024	54.9	64.3	70.7	74.5	67.3	64.4	57.6	77	70	65	59	56	45
036	58.5	67	70.7	71.1	67.6	64.6	57.7	76	69	64	58	55	44
048	63	66.9	72.5	73.7	70	68.7	60.3	78	71	66	60	57	46
060	60.6	65.7	69.2	64.2	66.6	65.4	56.5	75	68	63	57	54	43

NOTE - the octave sound power data does not include tonal correction.

[1] Tested according to AHRI Standard 270-2008 test conditions.

[2] Estimated sound pressure level at distance based on AHRI Standard 275-2010 method for equipment located on the ground, roof, or on side of building wall with no adjacent reflective surface within 9.8 feet. Sound pressure levels will increase based on changes to assumptions. For other applications, refer to AHRI Standard 275.

TXV USAGE

Use this table for C35, CH23, CH33, CH35 and CR33 Field Installed TXV Match-Ups.

Outdoor Unit Model No.	Order No.
16ACX-024	**12J18**
16ACX-036	**12J19**
16ACX-048	**12J20**
16ACX-060	**12J20**

CX35, CX38 and CHX35 coils and all Lennox air handlers are shipped with a factory installed TXV. In most cases, no change out of the valve is needed.

C35 and CH33 coils - Replace the factory installed orifice with the expansion valve listed .

CR33 and CH23 coils - Use the expansion valve listed.

CH35 coils - Factory installed orifice must be replaced with the expansion valve listed.

AHRI STANDARD 210/240

Cooling or heating capacities are net values, including the effects of blower motor heat, and do not include supplementary heat. Power input is the total power input to the compressor(s) and fan(s), plus any controls and other items required as part of the system for normal operation.

Units which do not have an indoor air-circulating blower furnished as part of the model, i.e., split system with indoor coil only, is established by subtracting from the total cooling capacity 1250 Btu/h per 1,000 cfm, and by adding the same amount to the heating capacity. Total power input for both heating and cooling is increased by 365 W per 1,000 cfm of indoor air circulated.

MOST POPULAR MATCHES

Outdoor Unit Model No.	Indoor Unit Model No.
16ACX-024	CX38-36B with SL280UH090V36B
16ACX-036	CX38-43C with SL280UH090V60C
16ACX-048	CX38-62C with SL280UH090V60C
16ACX-060	CX38-62C with SL280UH090V60C

REVISIONS

Sections	Description of Change
Optional Accessories	Added Remote Outdoor Temperature Sensor.

AHRI CERTIFIED™ www.ahridirectory.org
Unitary Small AC
AHRI Standard 210/240
Certification applies only when the complete system is listed with AHRI.

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