YORK®

MILLENNIUM ®
ROTARY SCREW LIQUID CHILLERS

INSTALLATION, OPERATION, MAINT. | Supersedes: Nothing | Form 160.47-NOM3 (599)

MODELS
YS BA BA S0 THRU YS FC FB S5
STYLE D

R-22 and R-134a

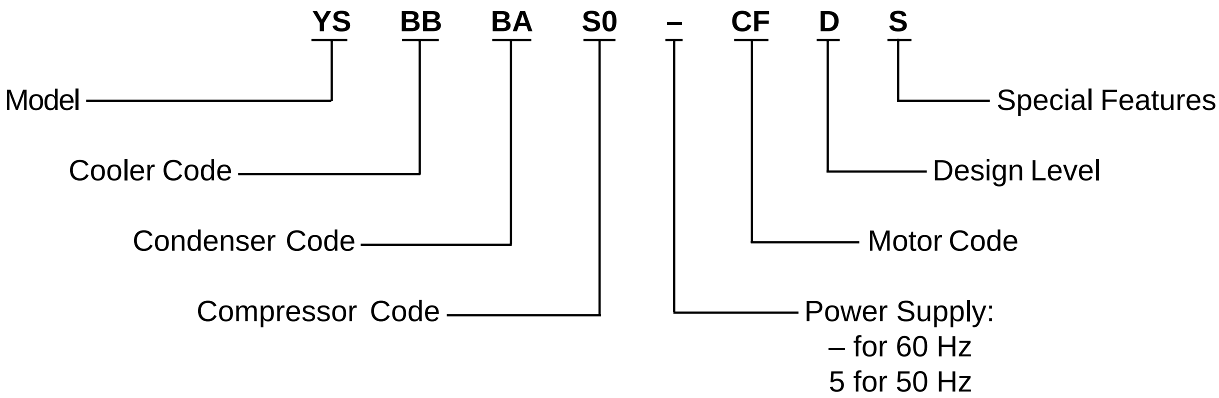
29039A(R)

Metric Conversions

Manufactured in
ISO-Certified Facility

NOMENCLATURE

The model number denotes the following characteristics of the unit:



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INSTALLATION

GENERAL

This instruction describes the installation of a Model YS Rotary Screw Liquid Chiller. (See Figure 1.) This unit is shipped as a single factory assembled, piped, wired and nitrogen or refrigerant charged package (Form 1 shipment). This unit requires a minimum of field labor to make chilled water connections, condenser water connections, refrigerant atmospheric relief connections, and electrical power connections.

YS units can also be shipped dismantled when required by rigging conditions, but generally it is more economical to enlarge access openings to accommodate the factory assembled unit.

The YS Chiller may be ordered and shipped in the following forms:

Form 1 – Factory Assembled Unit, Complete with Motor and Refrigerant and Oil Charges as discussed in this instruction.

Form 2 – Factory Assembled (same as Form 1) except not charged with oil or refrigerant. Shipped with holding charge of nitrogen. Refrigerant shipped in 50 and 125 lb. cylinders.

Form 3 – Driveline Separate From Shells – Shipped as three major assemblies.

Form 7 – Split Shells – Shipped as four major assemblies.

NOTE

Units shipped dismantled MUST be re-as-sembled by, or under the supervision of a York representative. Refer to Form 160.47-N3.1 for detailed instructions of Form 3 and 7 shipments.

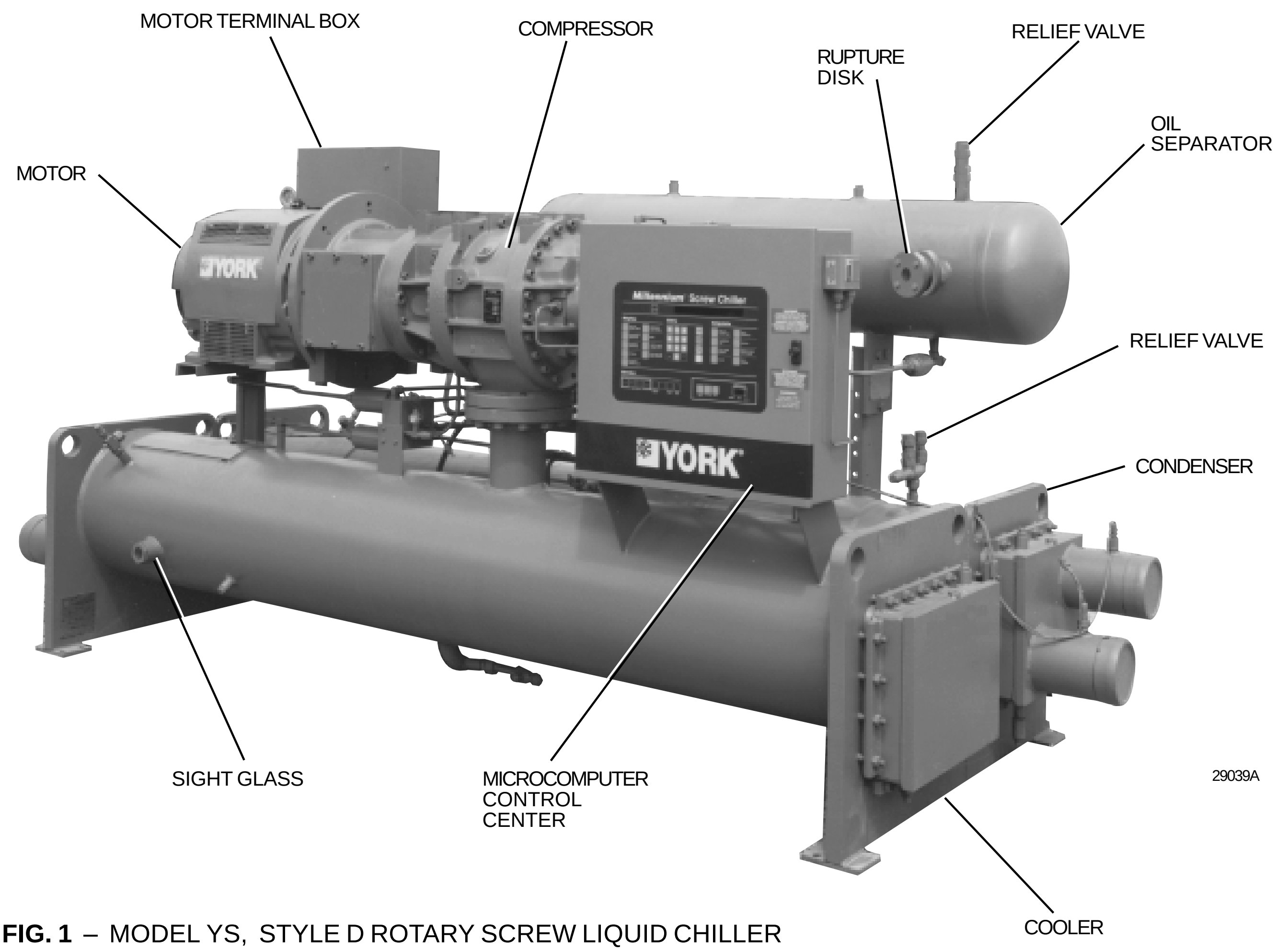
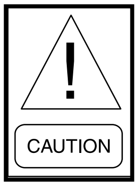


FIG. 1 – MODEL YS, STYLE D ROTARY SCREW LIQUID CHILLER



The York Warranty will be voided if the following restrictions are not adhered to:

1. No valves or connections should be opened under any circumstances because such action will result in loss of the factory refrigerant or nitrogen charge.

2. Do not dismantle or open the unit for any reason except under the supervision of a York representative.

3. When units are shipped dismantled, notify the nearest York office in ample time for a York representative to supervise rigging the unit to its operating position and the assembly of components.

4. Do not make final power supply connections to the compressor motor or control center.

5. Do not charge the system with oil.

6. Do not attempt to start the system.

7. Do not run hot water (100°F max.) or steam through the cooler or condenser at any time.

INSPECTION

The unit shipment should be checked on arrival to see that all major pieces, boxes and crates are received. Each unit should be checked on the trailer or rail car when received, before unloading, for any visible signs of damage. Any damage or signs of possible damage must be reported to the transportation company immediately for their inspection.

YORK WILL NOT BE RESPONSIBLE FOR ANY DAMAGE IN SHIPMENT OR AT JOB SITE OR LOSS OF PARTS. (Refer to Shipping Damage Claims, Form 50.15-NM.)

When received at the job site, all containers should be opened and the contents checked against the packing list. Any material shortage should be reported to York immediately.

DATA PLATE

A unit data plate is mounted on the control center assembly of each unit, giving unit model number; design working pressure; water passes; refrigerant charge; serial numbers; and motor power characteristics and connection diagrams. Refer to the "Nomenclature" on page 2 to verify data plate markings.

LOCATION

The chiller should be located in an indoor location where temperature ranges from 40°F to 110°F (4°C to 43°C).

The units are furnished with neoprene vibration isolator mounts for basement or ground level installations. Units may be located on upper floor levels providing the floor is capable of supporting the total unit operating weight. Refer to Tables 1 and 2.

Equipment room should be ventilated to allow adequate heat removal. Check ANSI, state, local or other codes.

FOUNDATION

A level floor, mounting pad or foundation must be provided by others, capable of supporting the operating weight of the unit.

CLEARANCE

Clearances should be adhered to as follows:

Rear, Ends and Above Unit	–	2 Ft. / 50mm
Front of Unit	–	3 Ft. / 75mm
Tube Removal	–	See Table 1 below

TABLE 1 – CLEARANCES

COMPRESSOR	TUBE REMOVAL SPACE	ADD – MARINE WATER BOXES
S0, S1, S2, S3	10–1 / 3073	1–6 / 457
S4, S5	12–1 / 3683	1–9 / 533

Dimensions in Ft–In / mm.

RIGGING

The complete standard unit is shipped without skids. (When optional skids are used, it may be necessary to remove the skids so riggers skates can be used under the unit end sheets to reduce the overall height.)

Each unit has four lifting holes (two on each end) in the end sheets which should be used to lift the unit. Care should be taken at all times during rigging and handling to avoid damage to the unit and its external connections. Lift only using holes shown in Figure 2.

WARNING

Do not lift the unit with slings around motor/compressor assembly or by means of eyebolts in the tapped holes of the com-pressor motor assembly. Do not turn a unit on its side for rigging. Do not rig with driveline in a vertical orientation.

CAUTION

If necessary to rig a unit by one end to permit lifting or dropping through a vertical passageway, such as an elevator shaft, contact York Factory for special rigging instructions.

The shipping and operating weights are given in Tables 2 and 3. Overall dimensions are shown in Figures 4 thru 7. More detailed dimensions can be found in Form 160.47-PA1.

If optional shipping skids are used, remove them before lowering the unit to its mounting position. Rig the unit to its final location on the floor or mounting pad by lifting the unit (or shell assembly) with an overhead lift and lower the unit to its mounting position.

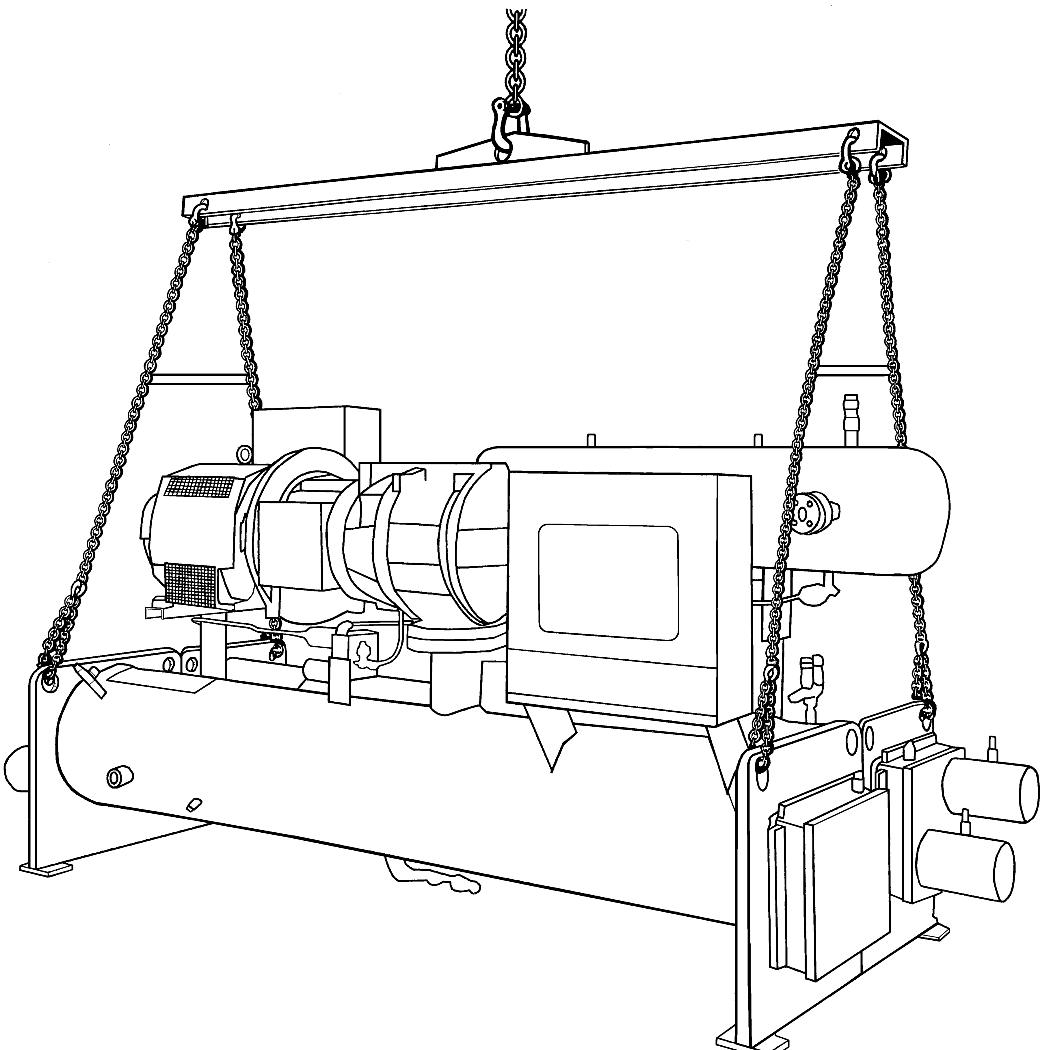


FIG. 2 – RIGGING

TABLE 2 – WEIGHTS - ENGLISH, R-22 AND R-134A UNITS, 50 AND 60 HZ

SHELL CODE COOLER – COND.	COM-PRES-SOR	SHIP-PING WT. (Lbs.)	OPER-ATING WT. (Lbs.)	REFRIG-ERANT CHARGE (Lbs. R-22)	REFRIG-ERANT CHARGE (Lbs. R-134a)
BA-BA	S0	8,388	9,019	490	441
BA-BB	S0	8,538	9,235	490	441
BB-BA	S0	8,494	9,187	460	414
BB-BB	S0	8,644	9,403	460	414
BA-CA	S0	9,142	9,996	520	468
BA-CB	S0	9,416	10,388	520	468
BB-CA	S0	9,271	10,186	480	432
BB-CB	S0	9,545	10,579	480	432
CA-BA	S0	9,297	10,084	620	558
CA-BB	S0	9,448	10,299	620	558
CB-BA	S0	9,528	10,412	620	558
CB-BB	S0	9,679	10,627	620	558
CA-CA	S0	10,011	11,020	650	585
CA-CB	S0	10,285	11,413	650	585
CB-CA	S0	10,242	11,348	650	585
CB-CB	S0	10,516	11,740	650	585
BA-BA	S1	8,454	9,085	490	441
BA-BB	S1	8,608	9,301	490	441
BB-BA	S1	8,560	9,253	460	414
BB-BB	S1	8,711	9,469	460	414
BA-CA	S1	9,208	9,974	520	468
BA-CB	S1	9,482	10,454	520	468
BB-CA	S1	9,337	10,252	480	432
BB-CB	S1	9,611	10,645	480	432
CA-BA	S1	9,363	10,150	620	558
CA-BB	S1	9,513	10,365	620	558
CB-BA	S1	9,594	10,478	620	558
CB-BB	S1	9,745	10,693	620	558
CA-CA	S1	10,077	11,086	650	585
CA-CB	S1	10,351	11,479	650	585
CB-CA	S1	10,308	11,414	650	585
CB-CB	S1	10,582	11,806	650	585
BA-BA	S2	10,542	11,174	—	441
BA-BB	S2	10,693	11,390	—	441
BB-BA	S2	10,648	11,342	—	414
BB-BB	S2	10,797	11,558	—	414
BA-CA	S2	11,298	12,065	—	468
BA-CB	S2	11,571	12,547	—	468
BB-CA	S2	11,426	12,342	—	432
BB-CB	S2	11,701	12,735	—	432
CA-BA	S2	11,452	12,241	—	558
CA-BB	S2	11,604	12,457	—	558
CB-BA	S2	11,683	12,567	—	558
CB-BB	S2	11,833	12,783	—	558
CA-CA	S2	12,146	13,155	680	612
CA-CB	S2	12,419	13,547	680	612
CB-CA	S2	12,377	13,483	680	612
CB-CB	S2	12,650	13,874	680	612

SHELL CODE COOLER – COND.	COM-PRES-SOR	SHIP-PING WT. (Lbs.)	OPER-ATING WT. (Lbs.)	REFRIG-ERANT CHARGE (Lbs. R-22)	REFRIG-ERANT CHARGE (Lbs. R-134a)
CA-DA	S2	13,357	14,765	750	675
CA-DB	S2	13,874	15,506	750	675
CB-DA	S2	13,588	15,093	750	675
CB-DB	S2	14,105	15,833	750	675
DA-CA	S2	13,293	14,480	840	756
DA-CB	S2	13,577	14,872	840	756
DB-CA	S2	13,668	15,008	840	756
DB-CB	S2	13,941	15,400	840	756
DC-CA	S2	14,026	15,552	840	756
DC-CB	S2	14,299	15,943	840	756
DA-DA	S2	14,549	16,124	950	855
DA-DB	S2	15,066	16,864	950	855
DB-DA	S2	14,869	16,608	910	819
DB-DB	S2	15,386	17,348	910	819
DC-DA	S2	15,215	17,437	840	756
DC-DB	S2	15,732	16,781	840	756
CA-CA	S3	12,360	13,372	—	612
CA-CB	S3	12,633	13,764	—	612
CB-CA	S3	12,591	13,698	—	612
CB-CB	S3	12,865	14,090	—	612
CA-DA	S3	13,574	14,983	—	675
CA-DB	S3	14,090	15,726	—	675
CB-DA	S3	13,804	15,313	—	675
CB-DB	S3	14,324	16,054	—	675
DA-CA	S3	13,497	14,673	840	756
DA-CB	S3	13,770	15,065	840	756
DB-CA	S3	13,861	15,201	840	756
DB-CB	S3	14,134	15,593	840	756
DC-CA	S3	14,219	15,744	840	756
DC-CB	S3	14,491	16,135	840	756
DA-DA	S3	14,741	16,316	950	855
DA-DB	S3	15,258	17,057	950	855
DB-DA	S3	15,061	16,800	910	819
DB-DB	S3	15,578	17,541	910	819
DC-DA	S3	15,408	17,333	840	756
DC-DB	S3	15,925	18,073	840	756
DA-CA	S4	17,068	18,247	—	740
DA-CB	S4	17,341	18,639	—	740
DB-CA	S4	17,431	18,776	—	740
DB-CB	S4	17,705	19,168	—	740
DC-CA	S4	17,791	19,320	—	740
DC-CB	S4	18,064	19,710	—	740
DA-DA	S4	18,313	19,893	—	830
DA-DB	S4	18,833	20,634	—	830
DB-DA	S4	18,635	20,378	—	800
DB-DB	S4	19,153	21,119	—	800
DC-DA	S4	18,983	20,912	—	740
DC-DB	S4	19,426	21,652	—	740

TABLE 2 – WEIGHTS - ENGLISH, R-22 AND R-134A UNITS, 50 AND 60 HZ (CONT'D)

SHELL CODE COOLER – COND.	COM-PRES-SOR	SHIP-PING WT. (Lbs.)	OPER-ATING WT. (Lbs.)	REFRIG-ERANT CHARGE (Lbs. R-22)	REFRIG-ERANT CHARGE (Lbs. R-134a)
EA-EA	S4	20,460	21,890	1,400	1,260
EA-EB	S4	21,104	22,743	1,400	1,260
EB-EA	S4	20,955	22,484	1,350	1,215
EB-EB	S4	21,533	23,337	1,350	1,215
EC-EA	S4	21,362	23,139	1,300	1,170
EC-EB	S4	22,000	23,991	1,300	1,170
EA-FA	S4	23,485	25,592	1,520	1,368
EA-FB	S4	24,695	27,192	1,520	1,368
EB-FA	S4	23,914	26,180	1,520	1,368
EB-FB	S4	25,119	27,781	1,450	1,305
EC-FA	S4	24,382	26,840	1,450	1,305
EC-FB	S4	25,592	28,435	1,450	1,305
FA-EA	S4	22,922	24,998	—	1,690
FA-EB	S4	23,638	25,853	—	1,690
FB-EA	S4	23,711	25,902	—	1,690
FB-EB	S4	24,288	26,757	—	1,690
FC-EA	S4	24,171	27,076	—	1,620
FC-EB	S4	25,141	27,929	—	1,620
FA-FA	S4	25,977	28,655	2,000	1,800
FA-FB	S4	27,187	30,256	2,000	1,800
FB-FA	S4	26,626	29,552	2,000	1,800
FB-FB	S4	27,830	31,152	1,900	1,710
FC-FA	S4	27,148	30,729	1,900	1,710
FC-FB	S4	28,688	32,324	1,900	1,710

SHELL CODE COOLER – COND.	COM-PRES-SOR	SHIP-PING WT. (Lbs.)	OPER-ATING WT. (Lbs.)	REFRIG-ERANT CHARGE (Lbs. R-22)	REFRIG-ERANT CHARGE (Lbs. R-134a)
EA-EA	S5	20,777	22,210	—	1,260
EA-EB	S5	21,423	23,065	—	1,260
EB-EA	S5	21,275	22,807	—	1,215
EB-EB	S5	21,853	23,682	—	1,215
EC-EA	S5	21,681	23,462	—	1,170
EC-EB	S5	22,322	24,317	—	1,170
EA-FA	S5	23,808	25,919	—	1,368
EA-FB	S5	25,020	27,521	—	1,368
EB-FA	S5	24,240	26,508	—	1,368
EB-FB	S5	25,445	28,112	—	1,305
EC-FA	S5	24,707	27,171	—	1,305
EC-FB	S5	25,919	28,769	—	1,305
FA-EA	S5	23,274	25,280	—	1,690
FA-EB	S5	23,920	26,135	—	1,690
FB-EA	S5	23,991	26,184	—	1,690
FB-EB	S5	24,568	27,036	—	1,620
FC-EA	S5	24,453	27,356	—	1,620
FC-EB	S5	25,423	28,211	—	1,620
FA-FA	S5	26,257	28,936	2,000	1,800
FA-FB	S5	27,467	30,536	2,000	1,800
FB-FA	S5	26,906	29,832	2,000	1,800
FB-FB	S5	28,111	31,433	1,900	1,710
FC-FA	S5	27,759	31,009	1,900	1,710
FC-FB	S5	28,969	32,604	1,900	1,710

NOTE:

1. Calculate total chiller weight by adding motor weight, solid state starter weight, and marine water box weights, if applicable.
2. Shipping weight includes refrigerant and oil charge. Operating weight includes water in tubes and water boxes.
3. Weights based on standard tubes in coolers and condensers.
4. Operating weight based on R-22. Subtract difference in refrigerant charge if using R-134a.

TABLE 3 – WEIGHTS - SI, R-22 AND R-134A UNITS, 50 AND 60 HZ

SHELL CODE COOLER – COND.	COM-PRES-SOR	SHIP-PING WT. (Kgs.)	OPER-ATING WT. (Kgs.)	REFRIG-ERANT CHARGE (Kgs. R-22)	REFRIG-ERANT CHARGE (Kgs. R-134a)
BA-BA	S0	3,805	4,091	222	200
BA-BB	S0	3,873	4,189	222	200
BB-BA	S0	3,853	4,167	209	188
BB-BB	S0	3,921	4,265	209	188
BA-CA	S0	4,147	4,534	236	212
BA-CB	S0	4,271	4,712	236	212
BB-CA	S0	4,205	4,620	218	196
BB-CB	S0	4,330	4,799	218	196
CA-BA	S0	4,217	4,574	281	253
CA-BB	S0	4,286	4,672	281	253
CB-BA	S0	4,322	4,723	281	253
CB-BB	S0	4,390	4,820	281	253
CA-CA	S0	4,541	4,999	295	265
CA-CB	S0	4,665	5,177	295	265
CB-CA	S0	4,646	5,147	295	265
CB-CB	S0	4,770	5,325	295	265
BA-BA	S1	3,835	4,121	222	200
BA-BB	S1	3,905	4,219	222	200
BB-BA	S1	3,883	4,197	209	188
BB-BB	S1	3,951	4,295	209	188
BA-CA	S1	4,177	4,524	236	212
BA-CB	S1	4,301	4,742	236	212
BB-CA	S1	4,235	4,650	218	196
BB-CB	S1	4,360	4,829	218	196
CA-BA	S1	4,247	4,604	281	253
CA-BB	S1	4,315	4,702	281	253
CB-BA	S1	4,352	4,753	281	253
CB-BB	S1	4,420	4,850	281	253
CA-CA	S1	4,571	5,029	295	265
CA-CB	S1	4,695	5,207	295	265
CB-CA	S1	4,676	5,177	295	265
CB-CB	S1	4,800	5,355	295	265
BA-BA	S2	4,782	5,069	—	200
BA-BB	S2	4,850	5,167	—	200
BB-BA	S2	4,830	5,145	—	188
BB-BB	S2	4,898	5,243	—	188
BA-CA	S2	5,125	5,473	—	212
BA-CB	S2	5,249	5,691	—	212
BB-CA	S2	5,183	5,598	—	196
BB-CB	S2	5,308	5,777	—	196
CA-BA	S2	5,195	5,553	—	253
CA-BB	S2	5,264	5,650	—	253
CB-BA	S2	5,299	5,700	—	253
CB-BB	S2	5,367	5,798	—	253
CA-CA	S2	5,509	5,967	308	278
CA-CB	S2	5,633	6,145	308	278
CB-CA	S2	5,614	6,116	308	278
CB-CB	S2	5,738	6,293	308	278

SHELL CODE COOLER – COND.	COM-PRES-SOR	SHIP-PING WT. (Kgs.)	OPER-ATING WT. (Kgs.)	REFRIG-ERANT CHARGE (Kgs. R-22)	REFRIG-ERANT CHARGE (Kgs. R-134a)
CA-DA	S2	6,059	6,697	340	306
CA-DB	S2	6,293	7,034	340	306
CB-DA	S2	6,164	6,846	340	306
CB-DB	S2	6,398	7,182	340	306
DA-CA	S2	6,030	6,568	381	343
DA-CB	S2	6,159	6,746	381	343
DB-CA	S2	6,200	6,808	381	343
DB-CB	S2	6,324	6,985	381	343
DC-CA	S2	6,362	7,054	381	343
DC-CB	S2	6,486	7,232	381	343
DA-DA	S2	6,599	7,314	431	388
DA-DB	S2	6,834	7,650	431	388
DB-DA	S2	6,745	7,533	413	371
DB-DB	S2	6,979	7,869	413	371
DC-DA	S2	6,902	7,909	381	343
DC-DB	S2	7,136	7,612	381	343
CA-CA	S3	5,606	6,066	—	278
CA-CB	S3	5,730	6,243	—	278
CB-CA	S3	5,711	6,213	—	278
CB-CB	S3	5,836	6,391	—	278
CA-DA	S3	6,157	6,796	—	306
CA-DB	S3	6,391	7,133	—	306
CB-DA	S3	6,261	6,946	—	306
CB-DB	S3	6,497	7,282	—	306
DA-CA	S3	6,122	6,656	381	343
DA-CB	S3	6,246	6,833	381	343
DB-CA	S3	6,287	6,895	381	343
DB-CB	S3	6,411	7,073	381	343
DC-CA	S3	6,450	7,141	381	343
DC-CB	S3	6,573	7,319	381	343
DA-DA	S3	6,687	7,401	431	388
DA-DB	S3	6,921	7,737	431	388
DB-DA	S3	6,832	7,620	413	371
DB-DB	S3	7,066	7,957	413	371
DC-DA	S3	6,989	7,862	381	343
DC-DB	S3	7,224	8,198	381	343
DA-CA	S4	7,742	8,277	—	336
DA-CB	S4	7,866	8,455	—	336
DB-CA	S4	7,907	8,517	—	336
DB-CB	S4	8,031	8,695	—	336
DC-CA	S4	8,070	8,764	—	336
DC-CB	S4	8,194	8,940	—	336
DA-DA	S4	8,307	9,023	—	376
DA-DB	S4	8,543	9,360	—	376
DB-DA	S4	8,453	9,243	—	363
DB-DB	S4	8,688	9,580	—	363
DC-DA	S4	8,611	9,486	—	336
DC-DB	S4	8,812	9,821	—	336

TABLE 3 – WEIGHTS - SI, R-22 AND R-134A UNITS, 50 AND 60 HZ (CONT'D)

1

SHELL CODE COOLER – COND.	COM-PRES-SOR	SHIP-PING WT. (Kgs.)	OPER-ATING WT. (Kgs.)	REFRIG-ERANT CHARGE (Kgs. R-22)	REFRIG-ERANT CHARGE (Kgs. R-134a)
EA-EA	S4	9,281	9,929	635	572
EA-EB	S4	9,573	10,316	635	572
EB-EA	S4	9,505	10,199	612	551
EB-EB	S4	9,767	10,586	612	551
EC-EA	S4	9,690	10,496	590	531
EC-EB	S4	9,979	10,882	590	531
EA-FA	S4	10,653	11,609	689	621
EA-FB	S4	11,202	12,334	689	621
EB-FA	S4	10,847	11,875	689	621
EB-FB	S4	11,394	12,601	658	592
EC-FA	S4	11,060	12,175	658	592
EC-FB	S4	11,609	12,898	658	592
FA-EA	S4	10,397	11,339	—	767
FA-EB	S4	10,722	11,727	—	767
FB-EA	S4	10,755	11,749	—	767
FB-EB	S4	11,017	12,137	—	767
FC-EA	S4	10,964	12,282	—	735
FC-EB	S4	11,404	12,669	—	735
FA-FA	S4	11,783	12,998	907	816
FA-FB	S4	12,332	13,724	907	816
FB-FA	S4	12,078	13,405	907	816
FB-FB	S4	12,624	14,131	862	776
FC-FA	S4	12,314	13,939	862	776
FC-FB	S4	13,013	14,662	862	776

SHELL CODE COOLER – COND.	COM-PRES-SOR	SHIP-PING WT. (Kgs.)	OPER-ATING WT. (Kgs.)	REFRIG-ERANT CHARGE (Kgs. R-22)	REFRIG-ERANT CHARGE (Kgs. R-134a)
EA-EA	S5	9,424	10,074	—	572
EA-EB	S5	9,717	10,462	—	572
EB-EA	S5	9,650	10,345	—	551
EB-EB	S5	9,913	10,742	—	551
EC-EA	S5	9,835	10,642	—	531
EC-EB	S5	10,125	11,030	—	531
EA-FA	S5	10,799	11,757	—	621
EA-FB	S5	11,349	12,484	—	621
EB-FA	S5	10,995	12,024	—	621
EB-FB	S5	11,542	12,752	—	592
EC-FA	S5	11,207	12,325	—	592
EC-FB	S5	11,757	13,050	—	592
FA-EA	S5	10,557	11,467	—	767
FA-EB	S5	10,850	11,855	—	767
FB-EA	S5	10,882	11,877	—	767
FB-EB	S5	11,144	12,264	—	735
FC-EA	S5	11,092	12,409	—	735
FC-EB	S5	11,532	12,797	—	735
FA-FA	S5	11,910	13,125	907	816
FA-FB	S5	12,459	13,851	907	816
FB-FA	S5	12,205	13,532	907	816
FB-FB	S5	12,751	14,258	862	776
FC-FA	S5	12,591	14,066	862	776
FC-FB	S5	13,140	14,789	862	776

NOTE:

1. Calculate total chiller weight by adding motor weight, solid state starter weight, and marine water box weights, if applicable.
2. Shipping weight includes refrigerant and oil charge. Operating weight includes water in tubes and water boxes.
3. Weights based on standard tubes in coolers and condensers.
4. Operating weight based on R-22. Subtract difference in refrigerant charge if using R-134a.

RIGGING (CONT'D)

NOTE

Units shipped dismantled should be assembled under the supervision of a York representative.

If the cooler is to be field insulated, the insulation should be applied while the unit is in the lift position, before the unit is placed in position.

LOCATING AND INSTALLING ISOLATOR PADS

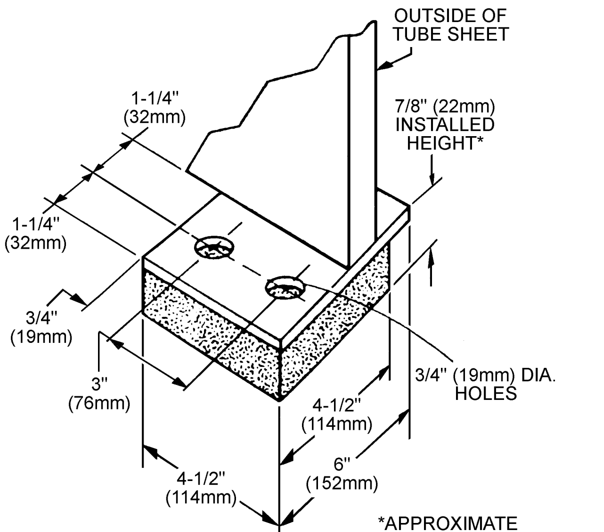
The isolator pads should be located in accordance with the floor layout of the dimensional product drawing, Form 160.47-PA1. After the isolator pads have been placed into position on the floor, lower the unit onto the pads. Make sure the pads are even with the edges of the mounting feet. When the unit is in place, remove the rigging equipment and check that the chiller is level, both longitudinally and transversely. See Figure 3.

The longitudinal alignment of the unit should be checked by placing a level on the top center of the cooler shell **under the compressor/motor assembly.** Transverse alignment should be checked by placing a level on top of the shell end sheets at each end of the unit.

The unit should be level within 1/4 inch from one end to the other end and from front to the rear. If the chiller is not level within the amount specified, lift it and place shims between the isolation pad and the tube sheets.

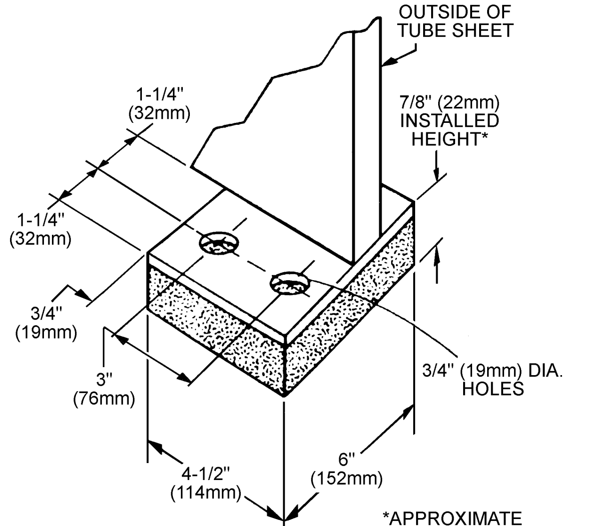
CHECKING THE ISOLATOR PAD DEFLECTION

All isolator pads should be checked for the proper deflection while checking the level of the unit. Each pad should be deflected approximately 0.15 inch (4mm). If an isolator pad is under deflected, shims should be placed between the unit tube sheet and the top of the pad to equally deflect all pads. Refer to Figure 3.



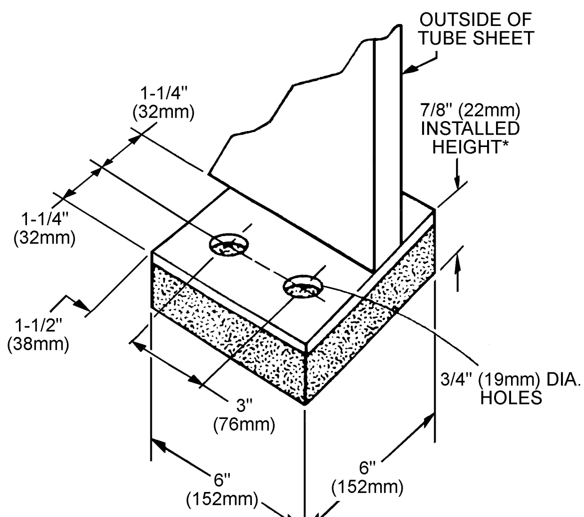
DETAIL A

LD02942



DETAIL B

LD02943



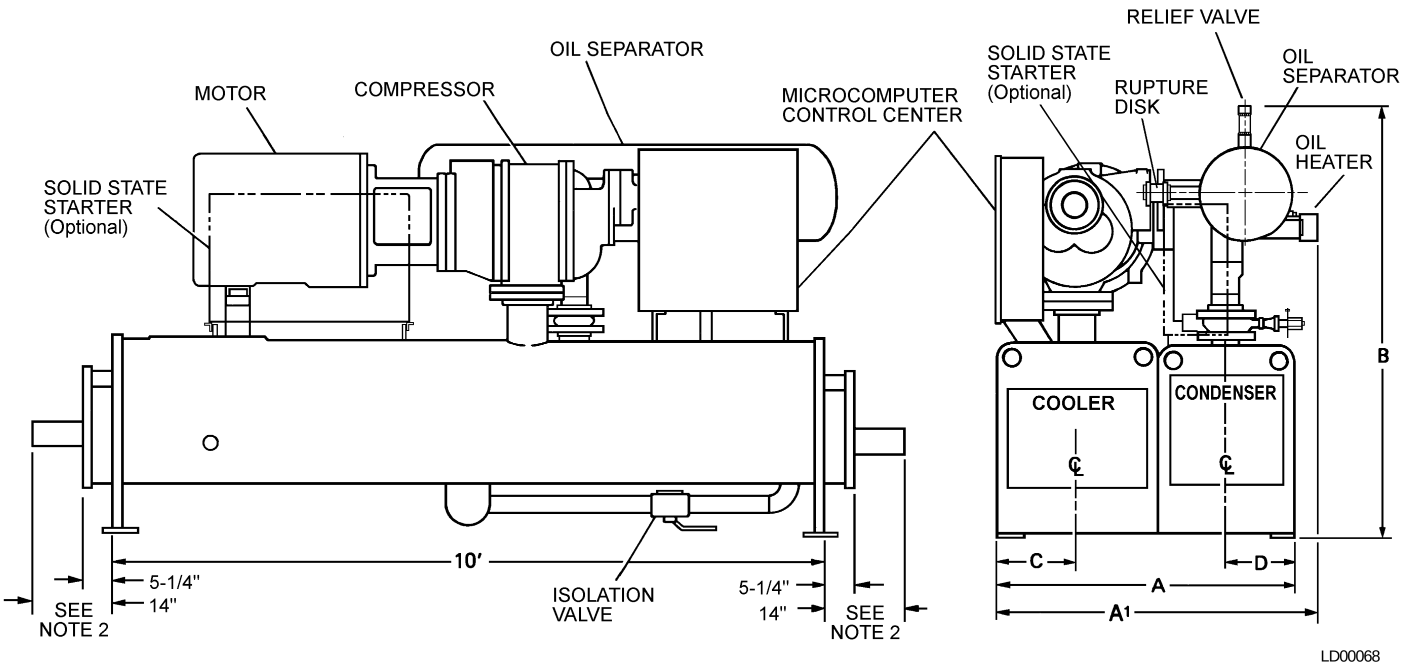
LD02944

DETAIL C

*APPROXIMATE
DEFLECTION 0.15" (4mm)

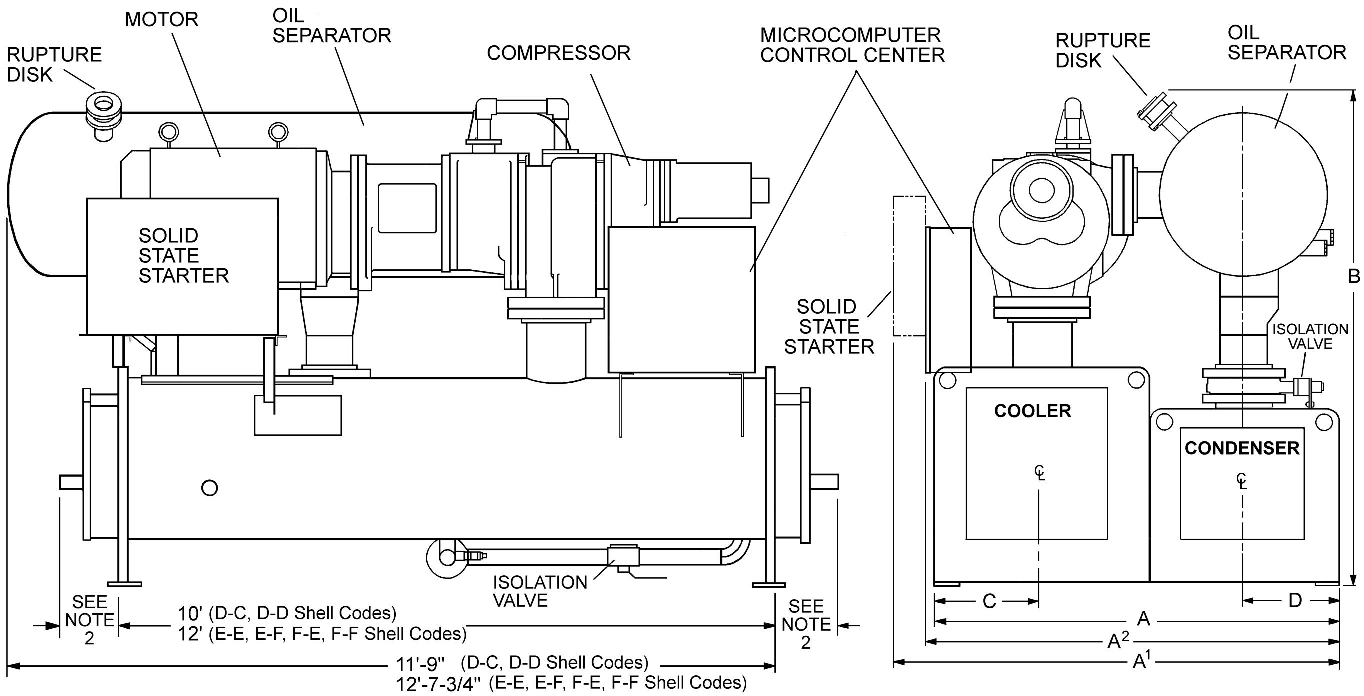
OPERATING WEIGHT (Lbs. / Kgs.)	DETAIL
UP TO 16,365 / 7,423	**A**
16,636 / 7,546 to 28,835 / 13,080	**B**
28,836 / 13,080 to 53,530 / 24,281	**C**

FIG. 3 – STANDARD NEOPRENE VIBRATION ISOLATOR PAD MOUNTS



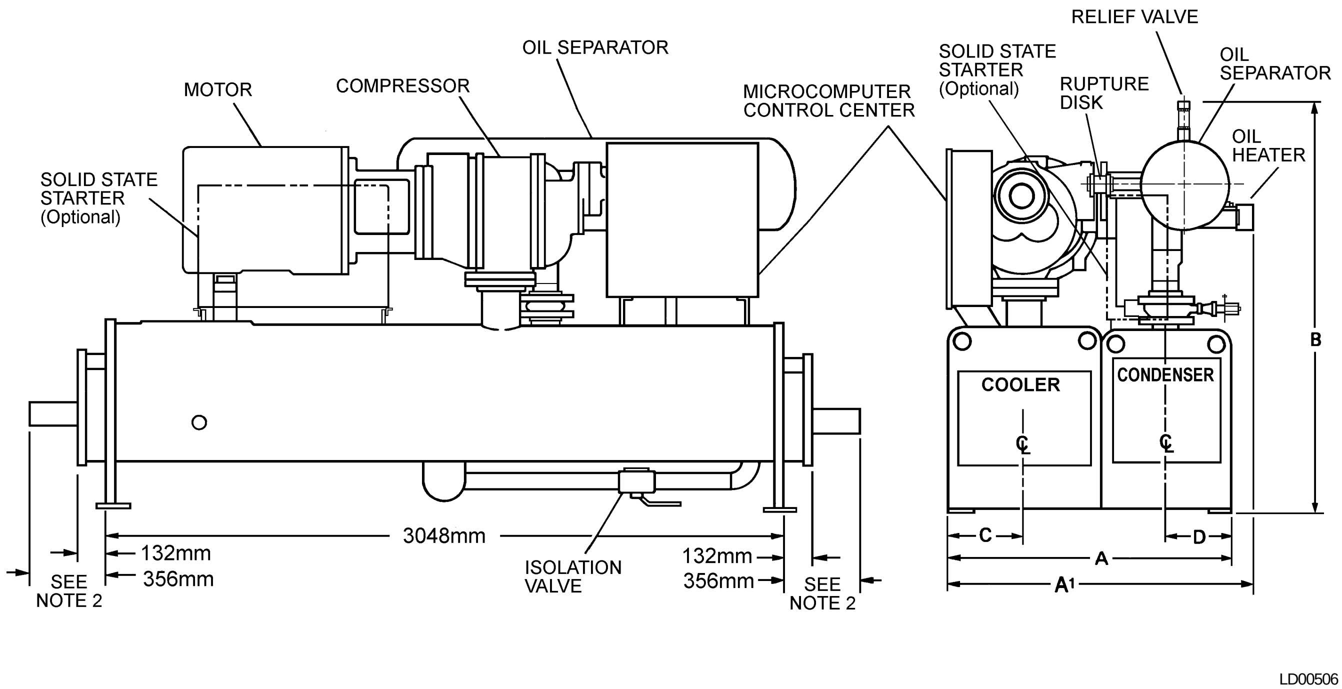
	S0 and S1 COMPRESSOR				S2 COMPRESSOR			S2 and S3 COMPRESSOR			
	SHELL CODES (Cooler – Condenser)										
	B-B	B-C	C-B	C-C	B-B	B-C	C-B	C-C	C-D	D-C	D-D
A – TUBE SHEET WIDTH	4'–2-7/8"				5'–2-1/2"			5'–2-1/2"			
A[1] – OVERALL WIDTH	4'–6-3/4"	4'–6-1/4"	4'-6-3/4"	4'–6-1/4"	5'–3-3/4"			5'–3-3/4"			
B – OVERALL HEIGHT[3]	5'–8-5/8"	5'–11-1/2"	5'–10-1/4"	5'–11-1/2"	5'–11-1/4"	6'–3-1/4"	6'–3-1/4"	6'–3-1/4"	6'–7-5/8"	6'–8-3/4"	6'–9-3/8"
C – COOLER C/L	1'–1-7/8"				1'–5"			1'–5"			
D – CONDENSER C/L	0'–11-5/8"				1'–2-1/4"			1'–2-1/4"			

FIG. 4 – OVERALL DIMENSIONS - ENGLISH, S0 THRU S3 COMPRESSOR



DIMENSION	S4 COMPRESSOR		S4 and S5 COMPRESSOR			
	SHELL CODES (Cooler – Condenser)					
	D-C	D-D	E-E	E-F	F-E	F-F
A TUBE SHEET WIDTH	6'–2"	6'–2"	6'–2"	6'–4-1/2"	6'–6-1/2"	6'–9"
A¹ – With SSS	6'–9-7/8"	6'–9-7/8"	6'–9-7/8"	7'–0-3/8"	7'–3-5/8"	7'–2-5/8"
A² – OVERALL WD. (less SSS)	6'–3-3/8"	6'–3-3/8"	6'–2"	6'–4-1/2"	6'–6-1/2"	6'–9"
B – OVERALL HEIGHT[3]	7'–9-1/8"	7'–9-1/8"	7'–9-1/8"	8'–2-1/4"	8'–2-1/4"	8'–2-1/4"
C – COOLER C/L	1'–7-3/4"	1'–7-3/4"	1'–7-3/4"	1'–7-3/4"	1'–10"	1'–10"
D – CONDENSER C/L	1'–5-1/4"	1'–5-1/4"	1'–5-1/4"	1'–6-1/2"	1'–5-1/4"	1'–6-1/2"

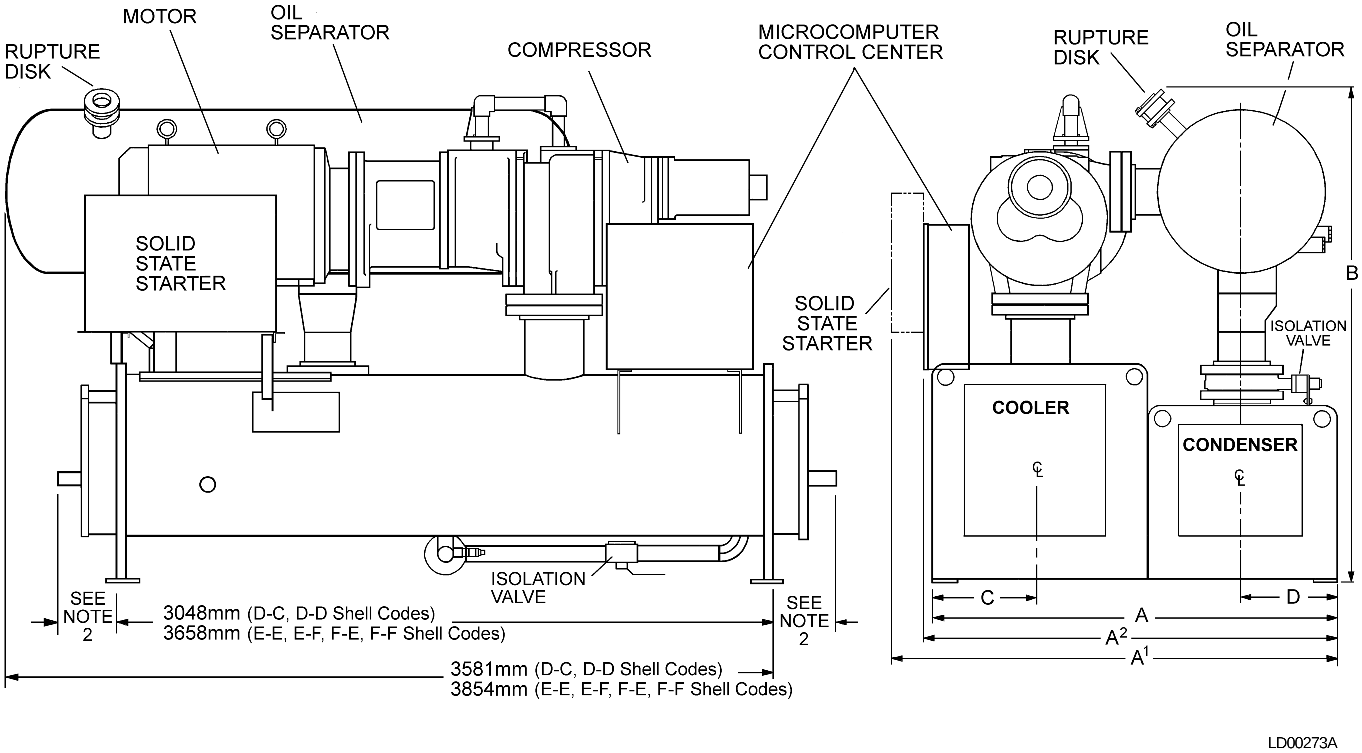
FIG. 5 – OVERALL DIMENSIONS - ENGLISH, S4 AND S5 COMPRESSOR



DIMENSIONS (mm)

	S0 and S1 COMPRESSOR				S2 COMPRESSOR			S2 and S3 COMPRESSOR			
	SHELL CODES (Cooler – Condenser)										
	B-B	B-C	C-B	C-C	B-B	B-C	C-B	C-C	C-D	D-C	D-D
A – TUBE SHEET WIDTH	1,292	1,292	1,292	1,292	1,588	1,588	1,588	1,588	1,588	1,588	1,588
A[1] – OVERALL WIDTH	1,349	1,349	1,349	1,349	1,591	1,591	1,591	1,591	1,591	1,591	1,591
B – OVERALL HEIGHT[3]	1,816	1,895	1,857	1,899	1,848	1,946	1,946	1,946	2,054	2,102	2,102
C – COOLER C/L	351	351	351	351	432	432	432	432	432	432	432
D – CONDENSER C/L	295	295	295	295	362	362	362	362	362	362	362

FIG. 6 – OVERALL DIMENSIONS - STANDARD INTERNATIONAL, S0 THRU S3 COMPRESSOR



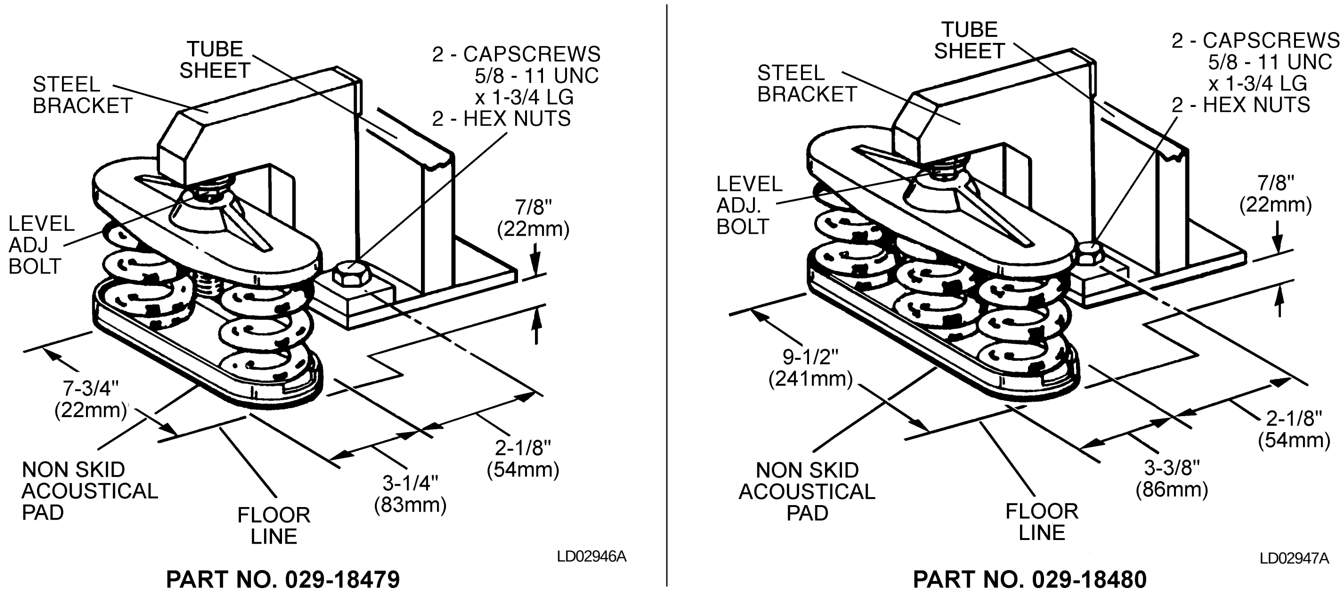
DIMENSIONS (mm)

	S4 COMPRESSOR		S4 and S5 COMPRESSOR			
	SHELL CODES (Cooler – Condenser)					
	D-C	D-D	E-E	E-F	F-E	F-F
A – TUBE SHEET WIDTH	1,880	1,880	1,880	1,943	1,994	2,057
A[1] – WITH SOLID STATE STARTER	2,080	2,080	2,080	2,143	2,226	2,200
A[2] – OVERALL WIDTH (Less S.S.S)	1,915	1,915	1,880	1,943	1,994	2,057
B – OVERALL HEIGHT[3]	2,365	2,365	2,365	2,496	2,496	2,496
C – COOLER C/L	502	502	502	502	559	559
D – CONDENSER C/L	438	438	438	470	438	470

FIG. 7 – OVERALL DIMENSIONS - STANDARD INTERNATIONAL, S4 AND S5 COMPRESSOR

INSTALLING OPTIONAL SPRING ISOLATORS

To install these spring isolators, first remove the bolts and nuts from the spring isolator bracket. Bolt the isolator bracket to the unit foot support before the unit is located on the floor. Place the four spring isolators in position in accordance with the product drawing, Form 160.47-PA1. The threaded adjusting bolts in each isolator should be screwed out of the isolator until the extended head of the screw fits snugly into the isolator bracket hole. Then the unit is lowered over the adjusting bolts. Refer to Figure 8.



SPRING ISOLATORS (4 Per Unit) – ENGLISH

COMPRESSOR SIZE	SYSTEM OPERATING WEIGHT (Lbs.)	PART NO.
S0, S1, S2, S3	UP to 6,865	029-18479-001
	6,866 to 9,818	029-18479-002
	9,819 to 12,182	029-18479-003
	12,183 to 15,272	029-18479-004
	15,273 to 18,272	029-18480-001
	18,273 to 22,909	029-18480-002
S4, S5	UP to 22,909	029-18480-002
	22,910 to 26,044	029-18480-003
	26,045 to 32,101	029-18480-004

SPRING ISOLATORS (4 Per Unit) – SI

COMPRESSOR SIZE	SYSTEM OPERATING WEIGHT (mm)	PART NO.
S0, S1, S2, S3	UP to 3,114	029-18479-001
	3,115 to 4,453	029-18479-002
	4,454 to 5,525	029-18479-003
	5,526 to 6,927	029-18479-004
	6,928 to 8,288	029-18480-001
	8,289 to 10,392	029-18480-002
S4, S5	UP to 10,392	029-18480-002
	10,392 to 11,813	029-18480-003
	11,814 to 14,561	029-18480-004

FIG. 8 – SPRING ISOLATORS (OPTIONAL)

The adjusting bolts should now be rotated one (1) turn at a time, in sequence, until the unit end sheets are about 7/8 inch (22mm) off the floor or foundation, and the unit is level. Check the level of the unit both longitudinally and transversly. If the adjusting bolts are not long enough to level the unit due to an uneven or sloping floor or foundation, steel shims (grouted, if necessary) must be added beneath the isolator assemblies as necessary.

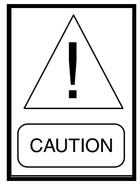
After the unit is leveled, wedge and shim under each corner to solidly support the unit in this position while piping connections are being made, pipe hangers adjusted and connections checked for alignment. Then the unit can be filled with water and checked for leaks. The adjusting bolts should now be finally adjusted and the wedges and shims can be removed. The unit should now be in correct level position, clear of the floor or foundation and without any effect from the weight of the piping. When the unit is properly supported, spring isolator deflection should be approximately 1 inch (25mm).

PIPING CONNECTIONS

After the unit is leveled (and wedged in place for optional spring isolators) the piping connections may be fabricated; chilled water, condenser water and refrigerant relief. The piping should be arranged with offsets for flexibility, and adequately supported and braced independently of the unit to avoid strain on the unit and vibration transmission. Hangers must allow for alignment of pipe. Isolators (by others) in the piping and hangers are highly desirable, and may be required by specifications. This is done to effectively utilize the vibration isolation characteristics of the isolator mounts on the unit.

CHECK FOR PIPING ALIGNMENT

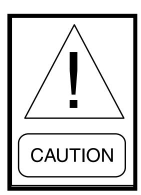
When piping is complete, check for alignment try opening a connection in each line, as close to the unit as possible, by removing the flange bolts or coupling. If any of the bolts are bound in their holes, or if the connection springs are out of alignment. The misalignment must be corrected by properly supporting the piping or by applying heat to anneal the pipe.



It may be necessary to weld chilled water piping directly to the water pipe nozzles. Since chiller water temperature sensor wells are often in close proximity to these connection points, sensors in the wells may often see temperatures of several hundred degrees. We have reason to believe that some potential exists for damaging these sensors from the transferred heat. Any damage will most likely show up as error in the sensor.

It is advisable to remove the sensors from the wells during the welding process as a precautionary measure. If the sensor is removed, assure that it bottoms out when it is placed back in the well.

This same precaution should also be observed whenever condenser water temperature sensors are present in the chiller system and condenser water piping is to be welded to the chiller.



If the piping is annealed to relieve stress, the inside of the pipe must be cleaned of scale before it is finally bolted in place.

COOLER AND CONDENSER WATER PIPING

The cooler and condenser liquid heads of YS units have nozzles which are grooved, suitable for welding 150 psig (1034 kPa) DWP flanges or the use of Victaulic couplings.

The nozzles and water pass arrangements are furnished in accordance with the job requirements (see Product Drawing, Form 160.47-PA1). Standard units are designed for 150 psig (1034 kPa) DWP on the water side. If job requirements are for greater than 150 psig (1034 kPa) DWP, check the unit data plate to determine if the unit has provisions for the required DWP before applying pressure to cooler or condenser.

COOLING UNITS – CHILLED WATER

Chilled water must leave the cooler through the connection marked “Liquid Outlet”. Cooling water must enter the condenser through the connection marked “Liquid Inlet”. Refer to Figure 9.

Foreign objects which could lodge in, or block flow through, the cooler and condenser tubes must be kept out of the water circuit. All water piping must be cleaned or flushed before being connected to the unit, pumps, or other equipment.

Permanent strainers (by others) are required in both the cooler and condenser water circuits to protect the unit as well as the pumps, tower spray nozzles, chilled water coils and controls, etc. The strainer, meeting York specifications should be installed in the entering chilled water line, directly up-stream of the unit.

Water piping circuits should be arranged so that the pumps discharge through the unit. The circuits should be controlled as necessary to maintain essentially constant chilled and condenser water flows through the unit at all load conditions.

If pumps discharge through the unit, the strainer may be located upstream from the pumps to protect both pump and unit. (Piping between the strainer, pump and unit must be very carefully cleaned before start-up.) If pumps are remotely installed from the unit, strainers should be located directly upstream.

COOLING UNITS – CONDENSER WATER CIRCUIT

For proper operation of the unit, condenser refrigerant pressure must be maintained above cooler pressure. If operating conditions will fulfil this requirement, no attempt should be made to control condenser water temperature by means of automatic valves, cycling of the cooling tower fan or other means. YS units are designed to function satisfactorily and efficiently, when condenser water is allowed to seek its own temperature level at reduced loads and off-peak seasons of the year. However, if entering condenser water temperature can go below the required minimum, condenser water temperature must be maintained equal to or slightly higher than the required minimum. Refer to Figure 9 for a typical water piping schematic for the cooling unit.

STOP VALVES

Stop valves may be provided (by others) in the cooler and condenser water piping, adjacent to the unit to ease maintenance. Pressure taps should be provided (by oth-

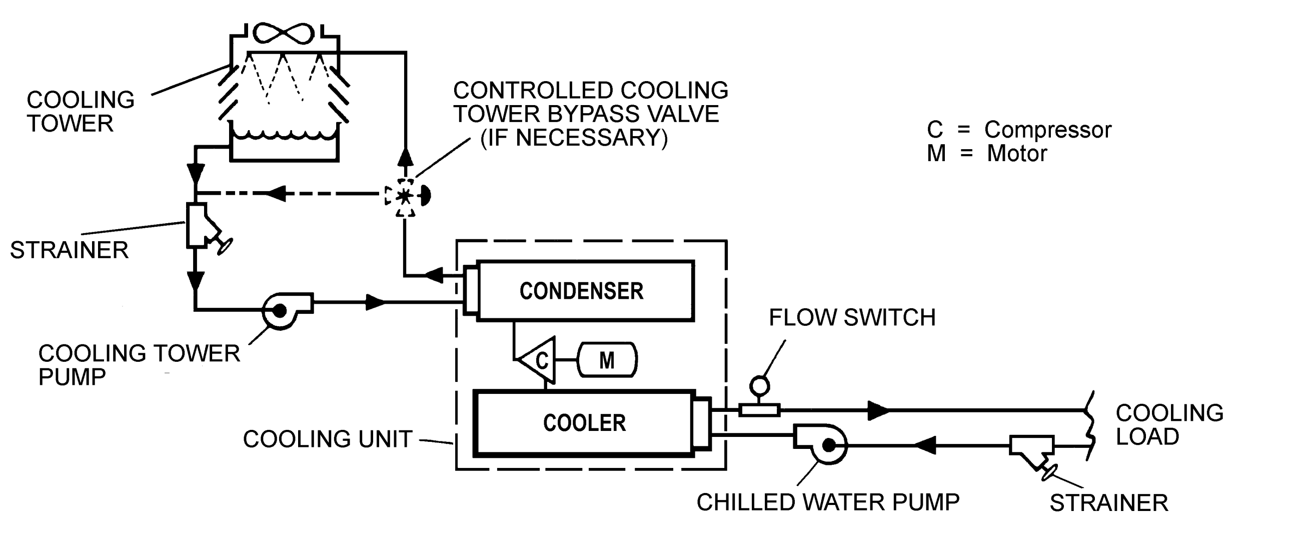


FIG. 9 – SCHEMATIC OF A TYPICAL PIPING ARRANGEMENT FOR COOLING UNITS

ers) in the piping as close to the unit as possible, to aid in obtaining operating checks.

FLOW SWITCHES (FIELD INSTALLED)

A flow switch or pressure differential control in the chilled water line(s), adjacent to the unit, is an accessory furnished for connection to the control center. If a flow switch is used, it must be directly in series with the unit and sensing only water flow through the unit. The differential switch must sense pressure drop across the unit.

DRAIN AND VENT VALVES

Drain and vent valves (by others) should be installed in the connections provided in the cooler and condenser liquid heads. These connections may be piped to drain if desired.

CHECKING PIPING CIRCUITS AND VENTING AIR

After the water piping is completed, but before any water box insulation is applied, tighten and torque the nuts on the liquid head flanges (to maintain between 30 and 60 ft. lbs. / 41 and 81 nm). Gasket shrinkage and handling during transit cause nuts to loosen. If water pressure is applied before this is done, the gaskets may be damaged and have to be replaced. Fill the chilled and condenser water circuits, operate the pumps manually and carefully check the cooler and condenser water heads and piping for leaks. Repair leaks as necessary. Before initial operation of the unit both water circuits should be thoroughly vented of all air at the high points.

REFRIGERANT RELIEF PIPING

Each unit is equipped with relief device(s) on the cooler, condenser and oil separator for the purpose of quickly relieving excess pressure of the refrigerant charge to the atmosphere in case of an emergency. The relief device is furnished in accordance with ASHRAE-15 and set to relieve at 300 psig (2069 kPa). The rupture disk on the oil separator is set at 345 psig (2379 kPa) and sized to accomodate the compressor pumping capacity. Refrigerant relief vent piping (by others), from the relief valves to the outside of the building, is required by code and should be installed on all units. The vent line(s) should be designed in accordance with ASHRAE-15 or local code(s). Refer to Figures 10, 11 and Table 4. For additional information on relief valve discharge line sizing, refer to Form 160.47-AD2.

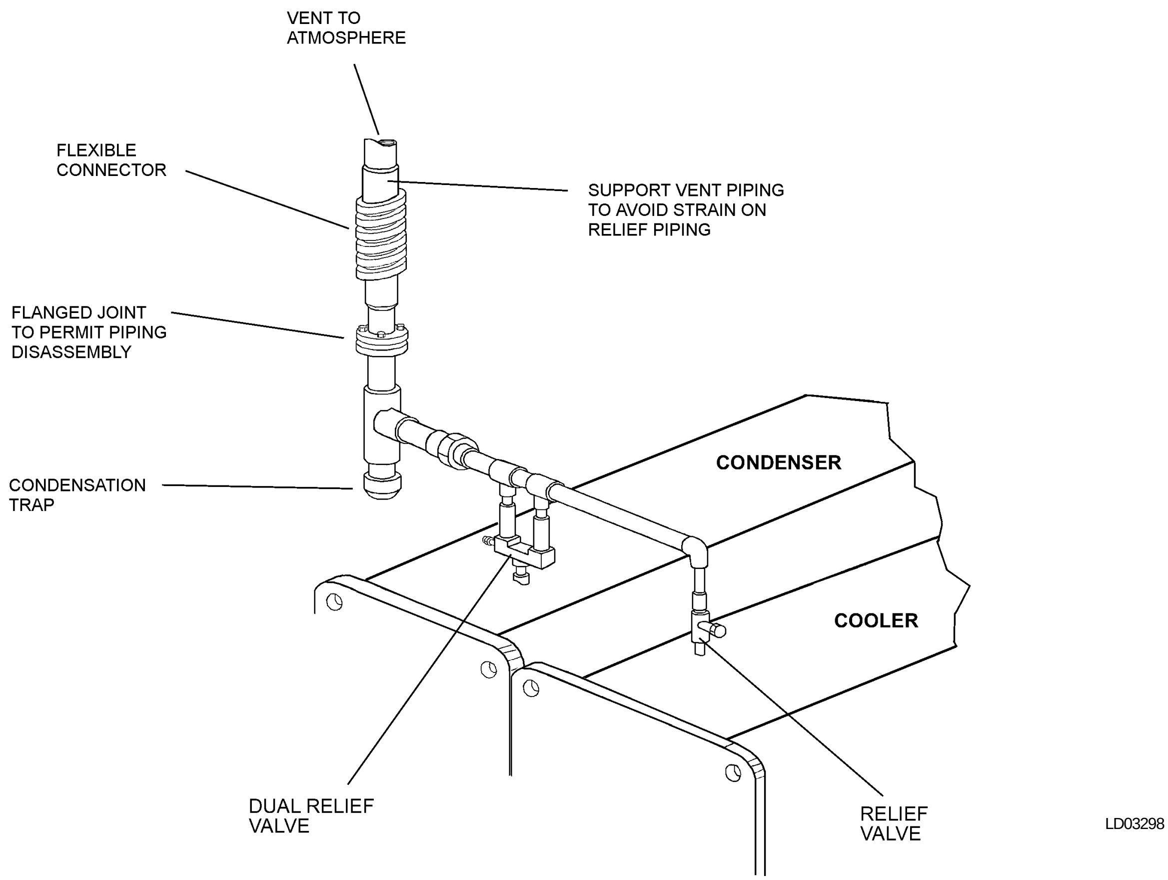
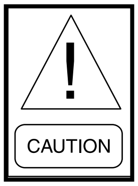


FIG. 10 – TYPICAL REFRIGERANT VENT PIPING FROM RELIEF VALVES



1. Piping should be properly supported to prevent any strain on bursting disk mounting.

2. Be careful not to puncture bursting disk when thread protector is removed.

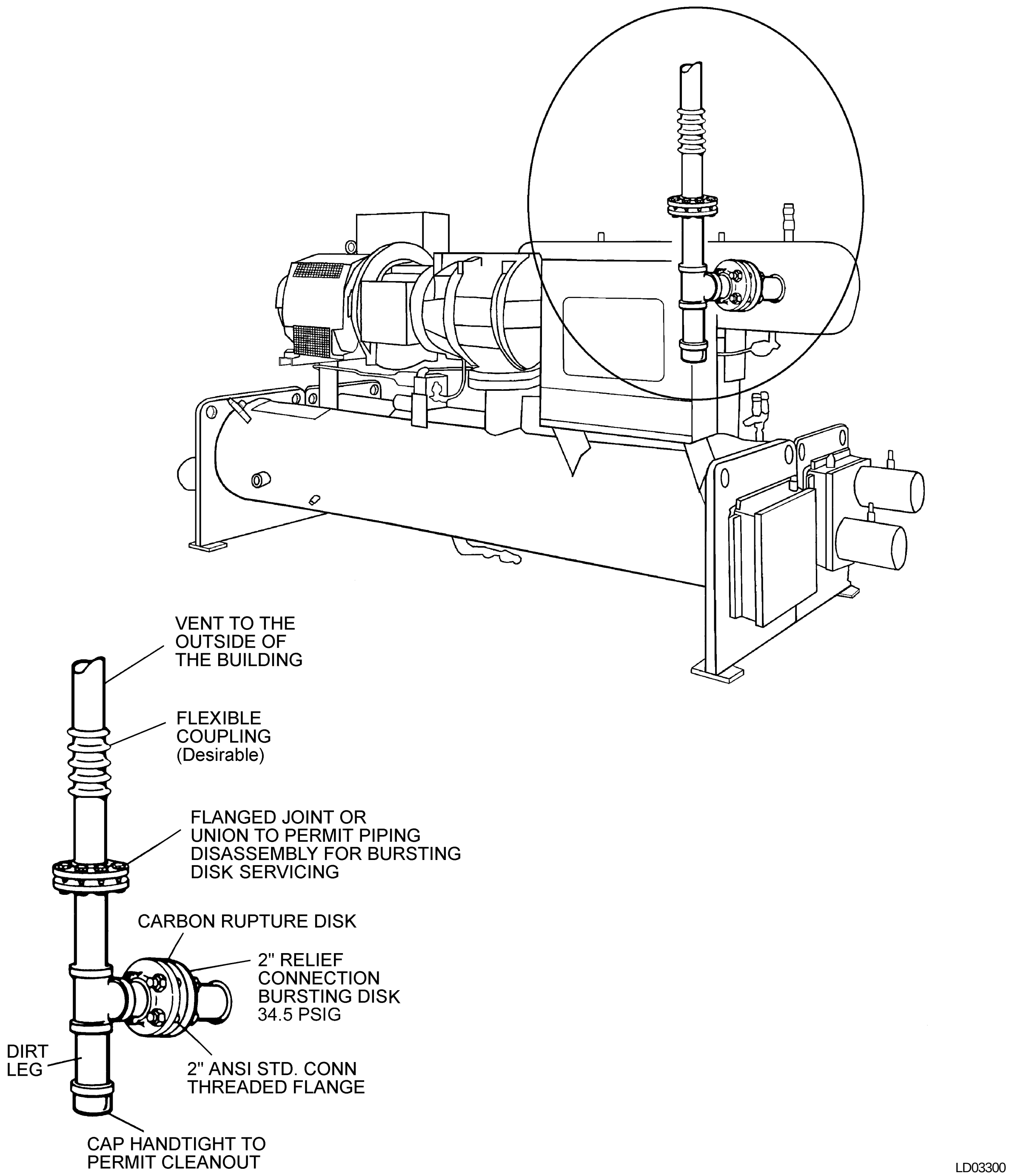


FIG. 11 – TYPICAL REFRIGERANT VENT PIPING FROM RUPTURE DISK

1

TABLE 4 – REFRIGERANT RELIEF CHARACTERISTICS

OIL SEPARATOR (R-22)

COMPRESSOR CODE	RELIEF VALVE			RUPTURE DISK	
	C	Cr	DUAL (1)	CR	SINGLE
	LBS. AIR PER MIN.		OUTLET NPT	#AIR/MIN.	OUTLET NPT
S0, S1 (2)	24.0	35.9	*3/4"	511.0	2"
S2, S3 (2)	28.3	35.9	3/4"	764.0	2"
S4 (2)	33.3	63.8	1"	1008.0	2-1/2"
S5 (2)	33.3	63.8	1"	1275.0	2-1/2"

OIL SEPARATOR (R-134a)

COMPRESSOR CODE	RELIEF VALVE			RUPTURE DISK	
	C	Cr	DUAL (1)	CR	SINGLE
	LBS. AIR PER MIN.		OUTLET NPT	#AIR/MIN.	OUTLET NPT
S0, S1 (2)	24.0	35.9	*3/4"	511.0	2"
S2, S3 (2)	28.3	35.9	3/4"	511.0	2"
S4 (2)	33.3	63.8	1"	764.0	2-1/2"
S5 (2)	33.3	63.8	1"	1008.0	2-1/2"

* Single relief valve

COOLER

SHELL	C	SINGLE RELIEF VALVE	
		Cr	OUTLET
	LBS. AIR PER MIN.		NPT
B	26.3	35.9	3/4"
C	31.7	35.9	3/4"
D	39.7	63.8	1"
E	51.2	63.8	1"
F	62.4	63.8	1"

CONDENSER

SHELL	C	DUAL RELIEF VALVE	
		Cr	OUTLET
	LBS. AIR PER MIN.		NPT
B	24.0	35.9	3/4"
C	28.3	35.9	3/4"
D	34.3	35.9	3/4"
E	41.2	63.8	1"
F	53.6	63.8	1"

Where:

C = Min. required discharge capacity

Cr = Rated capacity of York supplied relief valve @ 300 psig or rupture disk at 345 psig

Relief valve set pressure - 300 psig.

Rupture disk set pressure - 345 PSIG.

Notes: 1). Dual relief valve consists of one three-way shut off valve and two single relief valves. The valve configuration will not allow both valves to be shut off at the same time, and valves are sized such that each relief valve has sufficient discharge capacity when used alone. This permits safe removal of either relief valve for repair or replacement, while maintaining vessel protection.

2). ASHRAE 15-1994 Section 9.8 and Appendix F describes relief requirements for positive displacement compressors. Summa rized, the unit must be equipped with a relief device suitable for relieving the entire compressor capacity. YORK YS mod D (S0 - S5 compressor) units utilize a 2" rupture disk venting to atmosphere set at 345 psid. [See note 3 for S7 units.]

UNIT PIPING

Compressor lubricant piping and system refrigerant piping are factory installed on all units shipped assembled. On units shipped dismantled, the following piping should be completed under the supervision of the York representative; the lubricant piping; system oil return using material furnished. See Form 160.47-N3.1

CONTROL WIRING

After installation of the control center or units shipped disassembled, the control wiring must be completed between unit components and control center or solid state starter when used, using the wiring harness furnished.

Field wiring connections for commonly encountered control modifications (by others), if required, are shown on Wiring Diagram, Form 160.47-PW5.

NOTE

No deviations in unit wiring from that shown on drawings furnished shall be made without prior approval of the York Representative.

POWER WIRING

UNIT WITH ELECTRO-MECHANICAL STARTER

A 115 volt – single-phase – 60 or 50 Hertz power supply of 15 amperes must be furnished to the control center, from the optional control transformer (1-1/2 kVa required) included with the compressor-motor starter. DO NOT make final power connections to control center until approved by York Representative. Refer to Form 160.47-PW11.

POWER WIRING (CONT'D)

NOTE

Remote Electro-Mechanical starters for the YS Unit must be furnished in accordance with York Standard R-1079.

Each YS unit is furnished for a specific electrical power supply as stamped on the unit data plate, which also details the motor connection diagrams.

NOTE

To insure proper motor rotation, the starter power input and starter to motor connections must be checked with a phase sequence indicator in the presence of the York Representative.

> **IMPORTANT**
> DO NOT cut wires to final length or make final connections to motor terminals or starter power input terminals until approved by the York Representative.

Figure 12 shows the power wiring hook-up for YS Motor Connections. (Refer to Wiring Labels in Motor Terminal Box for hook-up to suit motor voltage and amperage.)

Motor leads are furnished with a crimp-type connection having a clearance hole for a 3/8 inch bolt, motor terminal lugs are not furnished.

UNIT WITH SOLID STATE STARTER (OPTIONAL)

A YS unit equipped with a Solid State Starter, does not require wiring to the compressor-motor. The motor power wiring is factory connected to the Solid State Starter (or an optional factory installed disconnect switch). All wiring to the control panel is completed by the factory. A control transformer is furnished with the Solid State Starter. Refer to Form 160.47-PW12.

INSULATION

Insulation of the type specified for the job, or minimum thickness to prevent sweating of 30°F surfaces (water chill application), should be furnished (by others) and applied to the cooler shell, end sheets, liquid feed line to flow chamber, compressor suction connection, and cooler liquid heads and connections. The liquid head flange insulation must be removable to allow head removal for tube maintenance. Details of areas to be insulated are given in Product Drawing, Form 160.47-PA1.

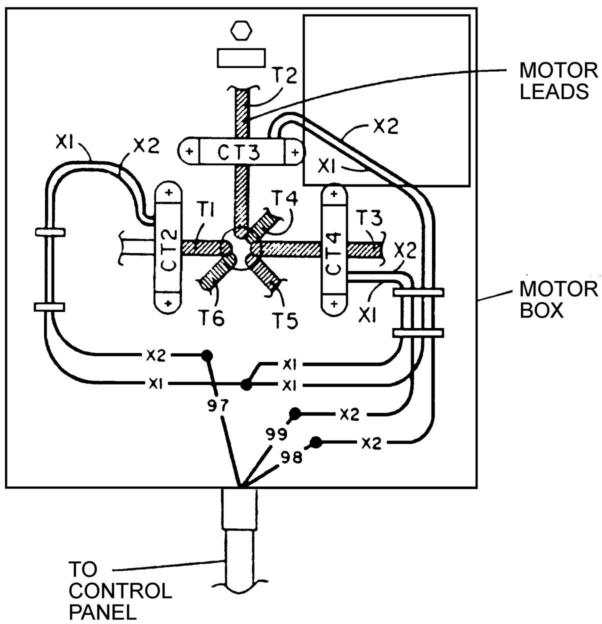
Units can be furnished, factory anti-sweat insulated, on order at additional cost. This includes all low temperature surfaces except the two cooler liquid heads.

> **IMPORTANT**
> DO NOT field insulate until the unit has been leak tested under the supervision of the York Representative.

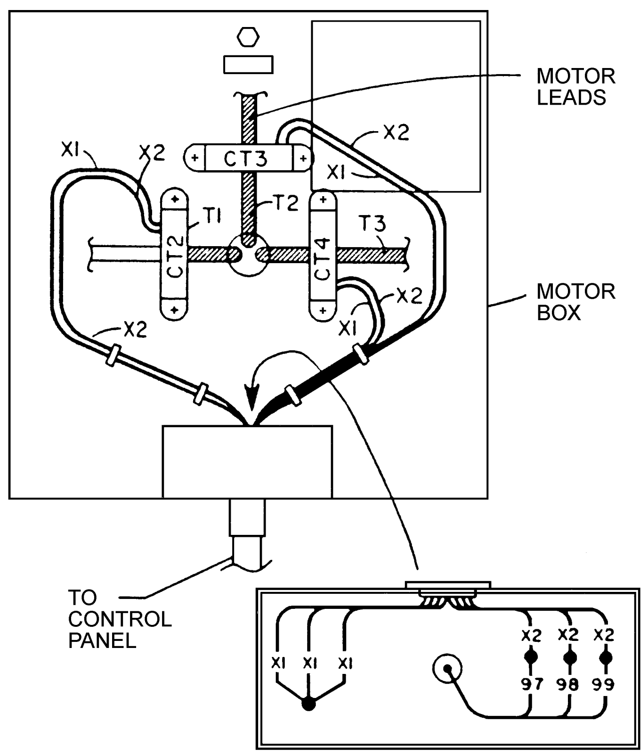
INSTALLATION CHECK – REQUEST FOR START-UP SERVICE

After the unit is installed, piped and wired as described in this Instruction, but before any attempt is made to start the unit, the York District Office should be advised so that the start-up service, included in the contract price, can be scheduled. Notification to the York Office should be by means of Installation Check List and Request, Form 160.47-CL1, in triplicate. (See Figure 13.)

The services of a York Representative will be furnished to check the installation and supervise the initial start-up and operation on all YS units installed within the Continental United States.



LOW VOLTAGE (6 LEAD MOTOR)
(200V – 600V)



HIGH VOLTAGE (3 LEAD MOTOR)
(2300V – 4160V)

LD03301

FIG. 12 – YS MOTOR CONNECTIONS (ELECTRO-MECHANICAL STARTER APPLICATION)

SUPERSEDES: 160.47-CL1 (390)

FORM 160.47-CL1 (790)

MODEL YS **YORK** ***MILLENNIUM™***

INSTALLATION CHECK LIST AND REQUEST FOR AUTHORIZED START-UP ENGINEER

***TO:** ______________________ **JOB NAME:** ______________________

______________________ **LOCATION:** ______________________

______________________ **CUSTOMER ORDER NO.** ______________________

YORK TEL. NO. ________ **YORK ORDER NO.** ________ **YORK CONTRACT NO.** ________

CHILLER

MODEL NO. ______________________ **SERIAL NO.** ______________________

The work (as checked below) is in process and will be completed by ________ / ________ / ________
Month Day Year

The following work must be completed in accordance with installation instructions

A. YORK CHILLER

1. Unit assembled (if shipped dismantled) and refrigerant piping installed under YORK Supervision ☐
2. Vibration isolator mounts so the unit is level, and isolators equally deflected ☐

B. WATER PIPING

1. Condenser water piping installed between condenser, pumps and cooling tower ☐
2. Chilled water piping installed between cooler, pumps and cooling coils ☐
3. Make-up and fill lines installed to cooling tower and chilled water system ☐
4. All water piping checked for strain – Piping should not spring when connections are broken at unit ☐
5. Water piping leak tested and flushed, and water strainers cleaned after flushing. Piping systems filled with water and trapped air vented ☐
6. Chilled and condenser water flow available to meet unit design requirements ☐

C. REFRIGERANT RELIEF PIPING (when required)

1. Refrigerant relief piping (with flexible connection) installed from unit to atmosphere (per ASHRAE-15) ☐

D. ELECTRICAL WIRING

1. Electro-mechanical starter ☐
   a. Main and control power supply available ☐
   b. Compressor motor starter furnished in accordance with YORK Standard R-1079 – Form 160.47-PA5.1 ☐
   c. Wiring completed from main power supply to starter – but not cut to length or connected to starter ☐
   d. Wiring completed from starter to compressor motor – but not cut to length or connected to motor ☐
   e. 115 volt service completed to Control Center – but not connected ☐
2. Solid state starter ☐
   a. Main and control power supply available ☐
   b. Wiring completed from main power supply to solid state starter—but not cut to length or connected to starter ☐
3. Control center
   a. Jumper wire not installed between terminal 24 and 25 located on the control center terminal strip ☐
   b. External control wiring completed from the control center to chilled water flow switches on interlocks in accordance with the YORK Wiring Diagram ☐
   c. Power available and wiring completed to the following starters and motors, and rotation of each checked ☐
      NOTE – Do not check compressor motor rotation
      (1.) Chilled water pump(s) ☐
      (2.) Condenser water pump(s) ☐
      (3.) Cooling tower fan ☐
   d. Meg ohm meter available for checking motor windings ☐

E. TESTING, EVACUATION AND CHARGING (Under York Supervision if Unit Shipped Less Refrigerant or Dismantled)

1. R-22 available for testing ☐
2. Dry Nitrogen available for testing ☐
3. A high vacuum pump available for evacuation and dehydration of system ☐
4. Refrigerant-22 (Supplied by YORK available for charging) ☐
5. Unit (ready to be) (has been) pressure tested, evacuated, dehydrated and charged ☐

F. CONDITIONS

1. YORK oil for compressor on job ☐
2. Cooling load available for testing and operating unit ☐
3. Personnel available for final wiring connections ☐
4. Personnel available for start-up and testing ☐
5. Owners operating personnel available for instruction ☐

Names: ______________________

____

____

With reference to the terms of the above contract, we are requesting the presence of your Authorized Representative at the job site on ________ / ________ / ________ (Month / Day / Year) to start the system and instruct operating personnel HAVE HIM CONTACT ______________________ (Names)

We understand that the services of the YORK Authorized Representative will be furnished in accordance with the contract for a period of not more than __________ consecutive normal working hours, and we agree that a charge of __________ per diem plus travel expenses will be paid to YORK if services are required for longer than __________ consecutive normal hours or if repeated calls are required.

Signed: ______________________

Title: ______________________

LD03305

FIG. 13 – INSTALLATION CHECK LIST AND REQUEST FOR AUTHORIZED START-UP ENGINEER

SECTION 2
OPERATION

BASIC DESCRIPTION

The York YS Chiller package uses a refrigerant-flooded evaporator and a liquid-cooled condenser. The compressor is a heavy-duty, industrial-rated rotary screw compressor. The package consists of four major components. Refer to the Chiller Package Component drawing, Figure 14.

COMPONENTS

DRIVELINE

The driveline is made up of the compressor and a heavy duty industrial induction motor. The motor is mounted to the compressor with a “D”-flange spacer. The “D”-flange eliminates the necessity to align the motor and compressor.

The compressor is a positive displacement, variable volume, direct drive, twin helical rotary screw compressor. The male rotor is a direct drive by the motor; the female rotor is an idler that is driven by the male rotor. The rotors do not touch each other or the compressor housing. The rotors are separated by a hydraulic oil seal, which prevents high pressure gas from leaking into low pressure areas.

Evaporator pressure gas is drawn into the compressor and compressed by the male and female rotors as they rotate together and reduce the volume of gas.

The compressor bearings are industrial duty rated, anti-friction rolling element bearings. No sleeve bearings are used. Oil is injected into the compressor by differential pressure to lubricate the bearings, seal the rotors and remove the heat of compression. The oil that is injected into the compressor mixes with the compressed gas and is separated from the refrigerant gas in the oil separator.

A slide valve is positioned between the male and female rotors, that moves axially to match the compressor capacity to that of the evaporator refrigeration load. The slide valve is moved by differential pressure. As the slide valve moves toward the unloaded position, less suction gas is pumped through the compressor. The control panel automatically positions the slide valve to match the load requirements. The slide valve can be operated manually. When the compressor is shut off, a spring returns the slide valve to unloaded position. The compressor starts with the slide valve in the unloaded position.

OIL SEPARATOR

The oil separator removes the oil that was injected into the compressor. The oil separator is a three stage design. Most of the oil separates by a reduction in velocity in the first stage. The discharge gas is then directed through a high surface area that collects more of the oil. The final stage is a coalescer element(s) that removes the fine aerosol particles of oil.

The oil separator is very efficient and removes nearly 100% of the oil. The very small amount of oil that does pass through the oil separator is returned to the compressor through a filter driers.

The oil separator is also a reservoir for the oil. A temperature controlled immersion heater is installed in the oil reservoir. The oil heater is interlocked with a low oil level safety switch.

CONDENSER

Oil free refrigerant gas leaving the oil separator flows into the condenser. Water flowing through the condenser removes the heat of compression and condenses the refrigerant gas into refrigerant liquid.

The liquid refrigerant then flows through the integral liquid sub-cooler located in the bottom of the condenser. The sub-cooled liquid refrigerant flows into the evaporator by deferential pressure.

EVAPORATOR

Condensing pressure refrigerant flows out of the liquid sub-cooler into the liquid line where the liquid refrigerant is metered into the evaporator by an orifice. The liquid refrigerant begins to flash (and cool) after flowing through the orifice plate. The refrigerant is distributed in the bottom of the evaporator. Liquid refrigerant floods the evaporator and the heat is exchanged from the evaporator liquid, flowing on the inside of the evaporator tubes, to the liquid refrigerant on the outside of the tubes.

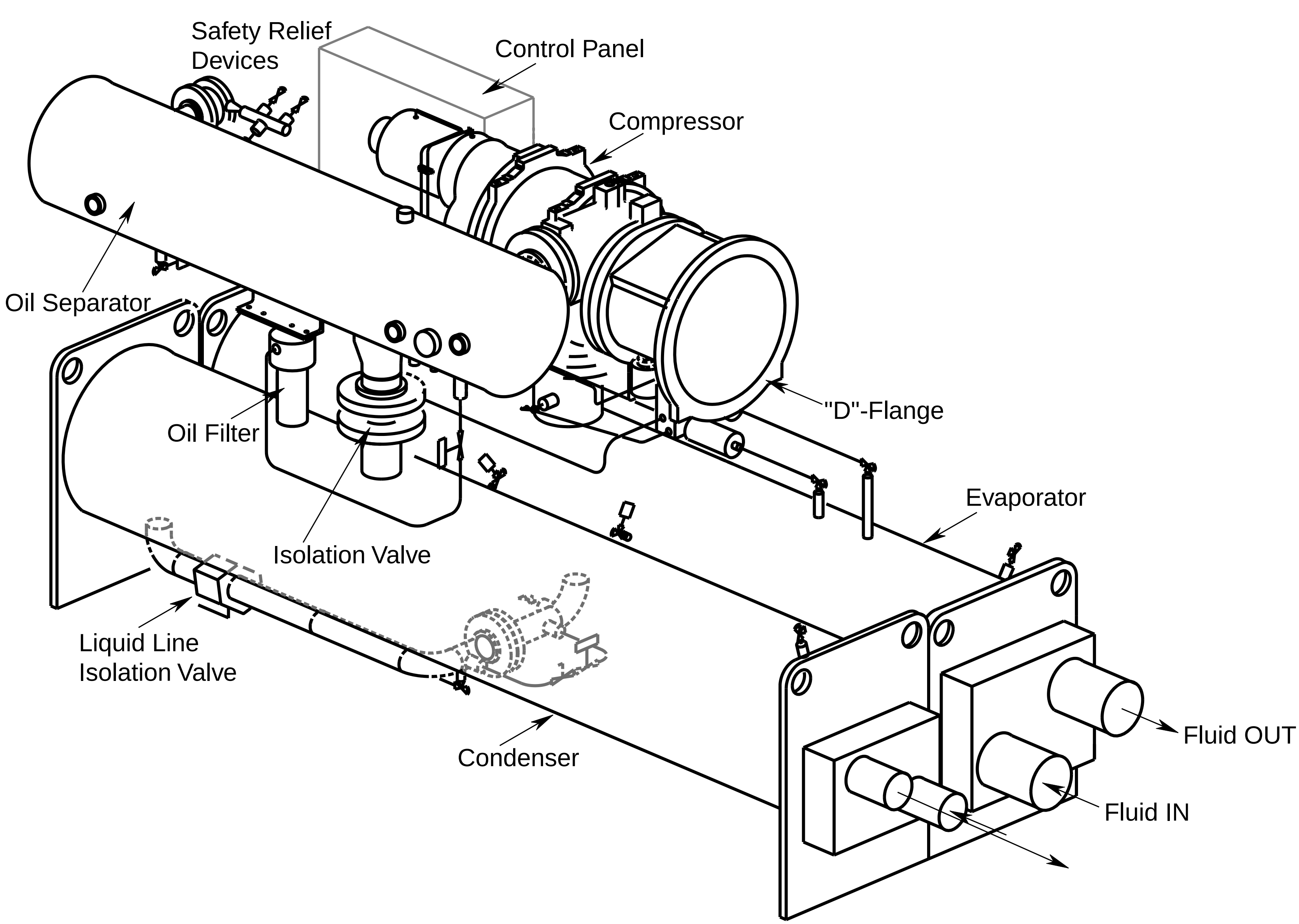


FIG. 14 – COMPONENT LAYOUT DRAWING

LD004303

EVAPORATOR (CONT'D)

A baffle is welded into the top of the evaporator to collect oil that falls from the compressor, preventing oil from mixing with the refrigerant charge. The baffle prevents liquid refrigerant from damaging the compressor.

CONDENSING WATER TEMPERATURE

YS Chillers can be operated with entering condensing water that is less than design conditions. The following formula is used to calculate the minimum entering condensing water temperature. Note the minimum entering condensing water temperature is dependant upon the operating load condition.

R-22 REFRIGERANT

ECW minimum = LCWT+11+[(%of load/100)(15 - design condenser deltaT)].

R-134a REFRIGERANT

ECW minimum = LCWT+16+[(%of load/100)(10 - design condenser deltaT)].

Where:

ECW minimum = Minimum Entering Condensing Water Temperature ºF

LCWT = Leaving Chilled Water Temperature ºF

Operating below the minimum entering condensing water will not provide energy savings and will result in oil management problems.

YS chillers may be started with entering condensing water temperatures as much as 25ºF below the leaving chilled water temperature. However, special entering condensing water temperature controls may be required when long condensing water circuits are used and the chiller is starting at low load conditions.

OIL SYSTEM

Refer to the Oil Piping Schematic Drawing, Figure 15 and the Oil Separator Drawing, Figure 16.

Oil flows from the oil separator into the compressor by differential pressure. The oil flows from the oil separator through a 3 micron oil filter (or optional dual oil filters). Filtered oil then flows to a oil manifold that is located at compressor port SB-2, see Figure 17.

00090VIP

FIG. 17 – OIL FILTER LOCATION

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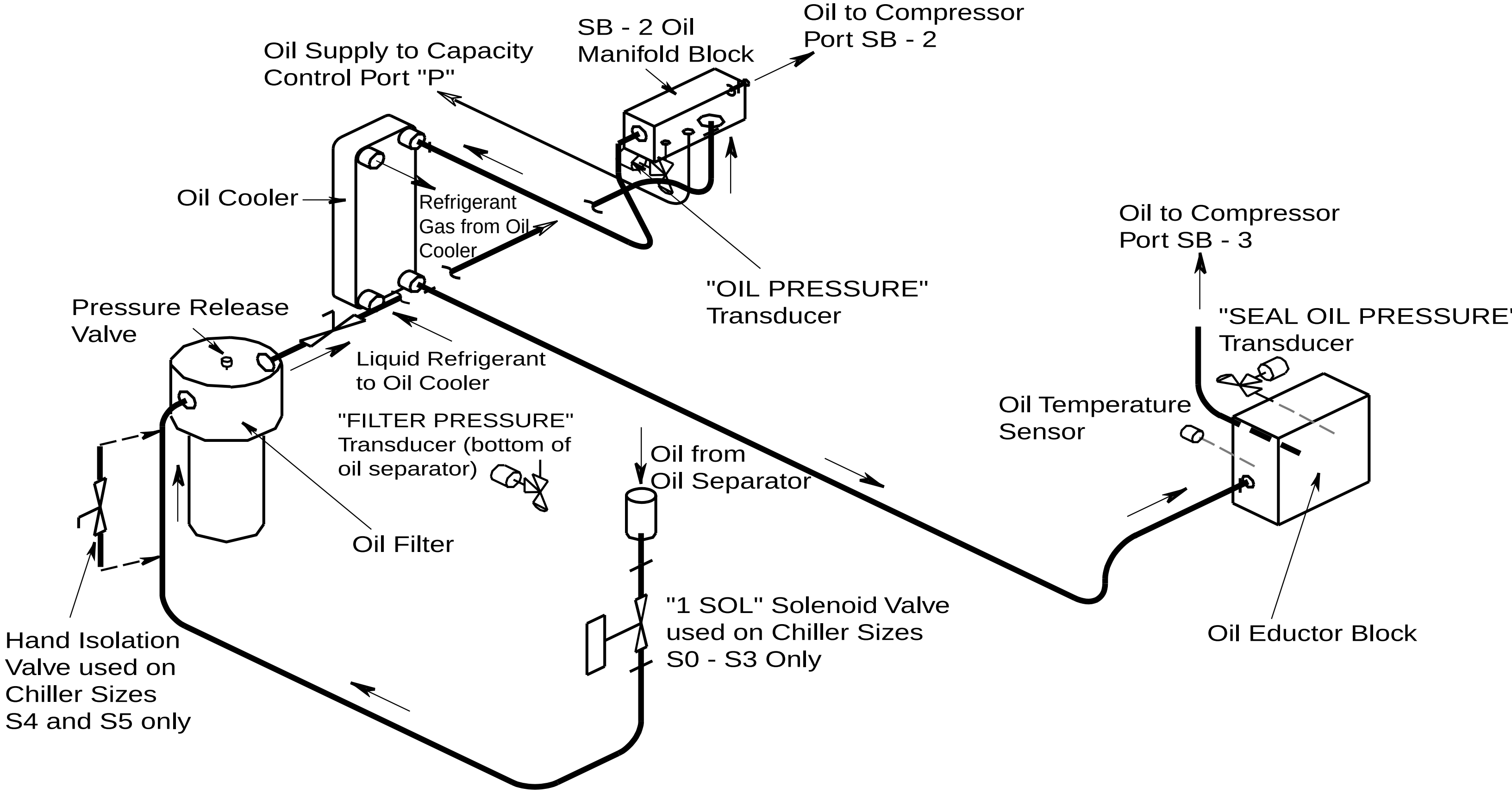

FIG. 15 – OIL PIPING SCHEMATIC

OIL SYSTEM (CONT'D)

The oil pressure transducer is located at the SB-2 manifold. The differential pressure is measured as the difference between the Oil Pressure Transducer at SB-2 and the Filter Pressure Transducer located in the oil separator. This value is compared to the limits in the control panel logic. If the oil filter differential reaches 20 psid, a warning message is displayed by the control panel display. If the oil filter reaches 25 psid, a safety shutdown is initiated. See Figure 18.

00091VIP

FIG. 18 – OIL PRESSURE TRANSDUCER LOCATION

An oil supply line from the manifold at SB-2 is piped to the capacity control directional valve at Port P. The 4-way capacity control solenoid (directional) valve directs oil pressure against one side or the other of the slide valve piston. The opposite side of the slide valve is relieved to suction pressure at compressor port SC-11. The differential pressure between the P port and the suction pressure at Compressor Port SC-11 is what provides the force to load or unload the slide valve and provide capacity control. Refer to the Capacity Control Schematic Diagram.

Oil flows from the oil manifold at SB-2 to the brazed plate, refrigerant cooled oil cooler. Cool oil leaving the brazed plate heat exchanger flows to the eductor block manifold. A new oil circuit has been incorporated into the oil eductor block in Design Level "D". The oil circuit is separate from the eductor oil management system. See Figure 19.

The eductor block manifold oil circuit contains the Seal Oil Pressure Transducer and a High Oil Temperature Safety sensor. The Seal Oil Pressure is monitored by the control panel. The differential pressure between the Seal Oil Pressure and the Evaporator Pressure Transducer is calculated and compared to the control panel logic. If the differential reaches the set point (30 psid for R-22 and 20 psid for R-134a, the control panel will initiate a safety shutdown. A high oil temperature safety shutdown will be initiated at 170ºF (77ºC).

The oil leaving the oil eductor manifold block flows into the compressor at compressor port SB-3 to lubricate the compressor bearings and shaft seal. All of the oil that is injected into the compressor mixes with refrigerant gas during compression. The oil and refrigerant gas is discharged into the oil separator, where it is separated and returned to the oil sump. A high discharge temperature safety is located in the discharge line, between the compressor and oil separator. This safety will initiate a safety shutdown at 210ºF (99ºC).

Oil is separated from the refrigerant gas in the oil separator. Oil is separated from the refrigerant gas in a three step process.

In the first stage of oil separation, high velocity oil and refrigerant gas in the compressor discharge line under goes a rapid reduction in velocity as it enters the large diameter oil separator. Most of the oil drops out of the refrigerant gas stream due to the reduction in velocity. The oil falls by gravity into the oil reservoir located in the bottom of the oil separator.

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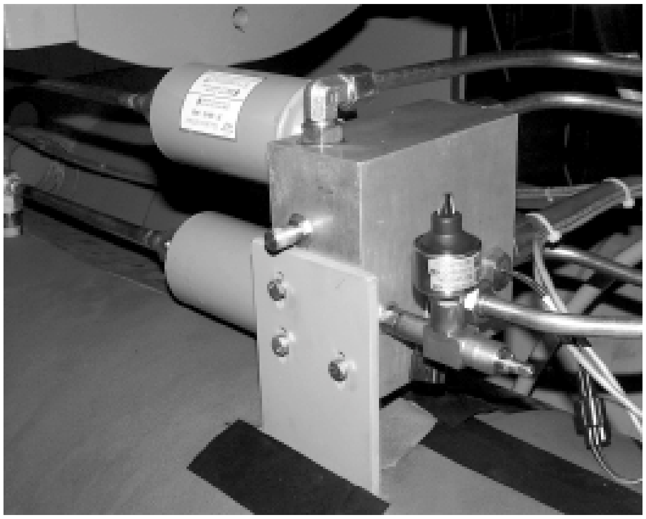

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FIG. 19 – EDUCTOR BLOCK

The second stage of oil separation is accomplished by directing the refrigerant gas through mesh pads that have an extended surface area. Smaller liquid oil drop-

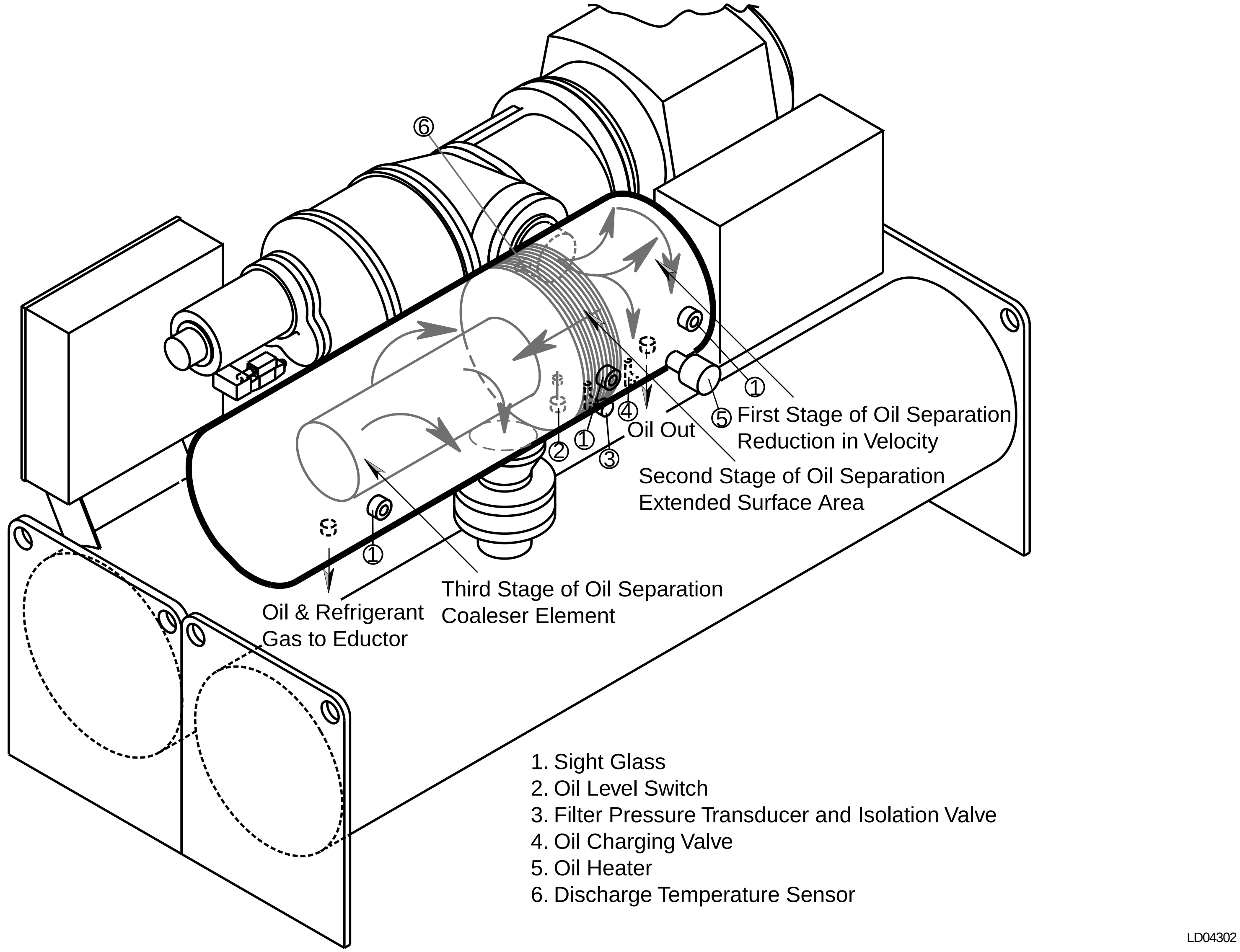

FIG. 16 – OIL SEPARATOR SCHEMATIC

OIL SYSTEM (CONT'D)

lets are collected on the extended surface area of the wire mesh pads where the oil falls by gravity into the oil reservoir.

The third and final stage of oil separation is achieved in the oil coalescing element section of the oil separator. The oil mixed with the refrigerant entering the coalescer element is a very fine aerosol mist about the size of cigarette smoke particles. These small aerosol mist particles wet the coalescer element media and form larger oil droplets which fall by gravity to the bottom of the coalescer element section. The oil collected in the coalescer section is drained from the oil separator with a small amount of refrigerant gas. This provides the high pressure "gas drive" for the eductors to return oil from the evaporator. Refer to paragraph Oil Eductor Circuit.

Three sight glasses are provided in the oil separator for monitoring the oil level and verifying performance of the coalescer element. Liquid oil should be visible in the top glass of the oil separator when the chiller is off. During operation, oil may be higher or lower due to system load and operating conditions.

A low oil level safety switch is provided in the bottom of the oil separator. A safety shutdown will be initiated if the oil level is below the switch setting for 30 continuous seconds after the chiller has been running for 3 minutes.

An oil drain and charging valve is located on the bottom of the oil separator. A 5/8 inch male flare connection is provided for ease of connecting a hose to quickly drain used oil into a EPA approved recovery cylinder or tank. Oil can be added into the oil reservoir with the chiller in service.

CAUTION

Do not add oil. York YS Chiller packages are pre-charged with the correct amount of York oil during functional testing after manufacture. Refer to the Oil Usage Table 6 in the Maintenance Section.

Oil loss is most often the result of operating conditions at loads under 10% of the chillers rated capacity and with condensing water that is too cold for load and operating condition.

The oil is not "lost" but has migrated into the refrigerant charge and is most likely in the evaporator. Excessive amounts of oil in the evaporator will result in operational problems.

Oil management problems result if the compressor discharge superheat is not maintained at the values listed in Table 8. Compressor discharge superheat is the difference between the compressor discharge temperature and the saturated condenser temperature. Compressor discharge superheat is used in conjunction with the evaporator approach to determine the most efficient refrigerant charge.

WARNING

Should the control panel display EXCESS CHARGE WARNING this is most likely the result of excessive amounts of oil in the evaporator. Excess amounts of oil in the refrigerant will cause foaming. The oil foam carries liquid refrigerant into the compressor. This results in lowering the compressor discharge superheat to low levels. If the compressor discharge superheat falls to within 10ºF of the saturated condensing temperature the control panel will display EXCESS CHARGE WARNING. Compressor loading will be inhibited while the EXCESS CHARGE WARNING is displayed. The inhibit loading will remain in effect until the compressor discharge superheat increases to 15ºF.

OIL EDUCTOR CIRCUIT

An oil eductor circuit is provided to properly manage the amount of oil in the refrigerant charge. A small amount of oil is normal in the refrigerant charge and will be found in the evaporator. If not properly managed the oil will accumulate and have adverse consequences regarding chiller performance.

The oil eductor circuit consists of three refrigerant and oil filter driers, two "jet pump" eductors and the interconnecting piping. Refer to Figures 20 and 21.

The eductors operate using the "jet pump" principle. Discharge pressure gas and oil flows through a filter dryer located at the bottom of the oil separator. The

OIL EDUCTOR CIRCUIT (CONT'D)

discharge pressure gas and oil flows through a regulating orifice and nozzle located in the eductor block. The reduced pressure (pumping action) is created by the velocity of the discharge pressure gas and oil flowing through the orifice and nozzle. This creates a reduced pressure area that allows the oil-rich refrigerant and oil to flow from the evaporator into the compressor.

Oil-rich refrigerant flows into the eductor block through the filter drier from the evaporator. The oil rich refrigerant mixes with the discharge pressure gas and flows into the compressor suction line.

A second eductor flows oil, which may have collected in the evaporator trough through the second filter drier located on the eductor block. This oil mixes with the discharge gas in the eductor block and flows to the compressor at port SC-5.

The filter driers should be changed annually or when excessive amount of oil is indicated in the refrigerant charge.

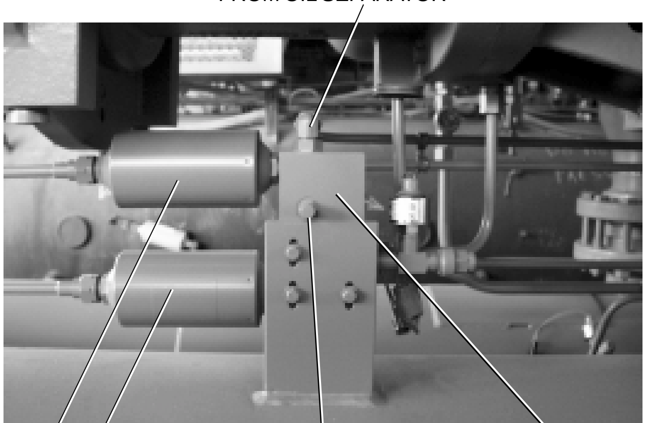

FIG. 20 – FILTER DRIERS AND OIL EDUCTOR

LIQUID REFRIGERANT CIRCUIT

Liquid refrigerant flows from the condenser into the evaporator by differential pressure. Sub-cooled liquid refrigerant flows out of the condenser into the liquid line. A metering orifice is installed in the liquid line to control the rate liquid refrigerant flows into the evaporator. The orifice is selected based upon the operating conditions of the chiller. Refer to Figure 22.

YS Chillers (S0 – S5) are supplied with a variable orifice arrangement. In parallel with the metering orifice is a solenoid valve and hand-throttling valve. The solenoid is energized open by the DIFFERENTIAL PRESSURE set point that is field programmable from the panel. The differential pressure between condensing pressure and evaporating pressure is compared to the set point value. When the differential pressure is at or less than the setpoint, the solenoid valve is energized open. The solenoid valve is de-energized closed when the differential pressure is equal to or greater than the setpoint plus 10 psig. A hand-throttling valve is provided to adjust the refrigerant flow rate through the solenoid valve to match the system operating conditions.

Dual Service Chillers – Ice duty and comfort cooling air conditioning applications will require the solenoid valve to be energized open in the air conditioning mode of operation since this represents the low differential pressure mode of operation.

The differential pressure set point is field programmable within the ranges specified in Table 5 for different refrigerants and EPROM version S.01F.17 and later. See York Service Bulletin 160.47-M2 (SB18) for programming instructions.

TABLE 5 – VARIABLE ORIFICE PRESSURE DIFFERENTIAL SETPOINTS

REFRIGERANT	DIFFERENTIAL PRESSURE RANGE
R-22	25 - 150 PSID
R-134A	15 - 110 PSID

A liquid line hand-isolation valve is located between the condenser and the metering orifice plate. This valve, in combination with the hand isolation valve between the oil separator and the condenser, allows all of the refrigerant charge to be stored in the condenser.

A ½ inch liquid refrigerant supply is piped from the bottom of the liquid line to the refrigerant cooled oil cooler. The refrigerant gas from the oil cooler is piped directly into the evaporator.

A liquid refrigerant-charging valve is piped into the liquid line between the evaporator and the metering orifice. A ¾ inch male flare connection is provided for connecting hoses or transfer lines.

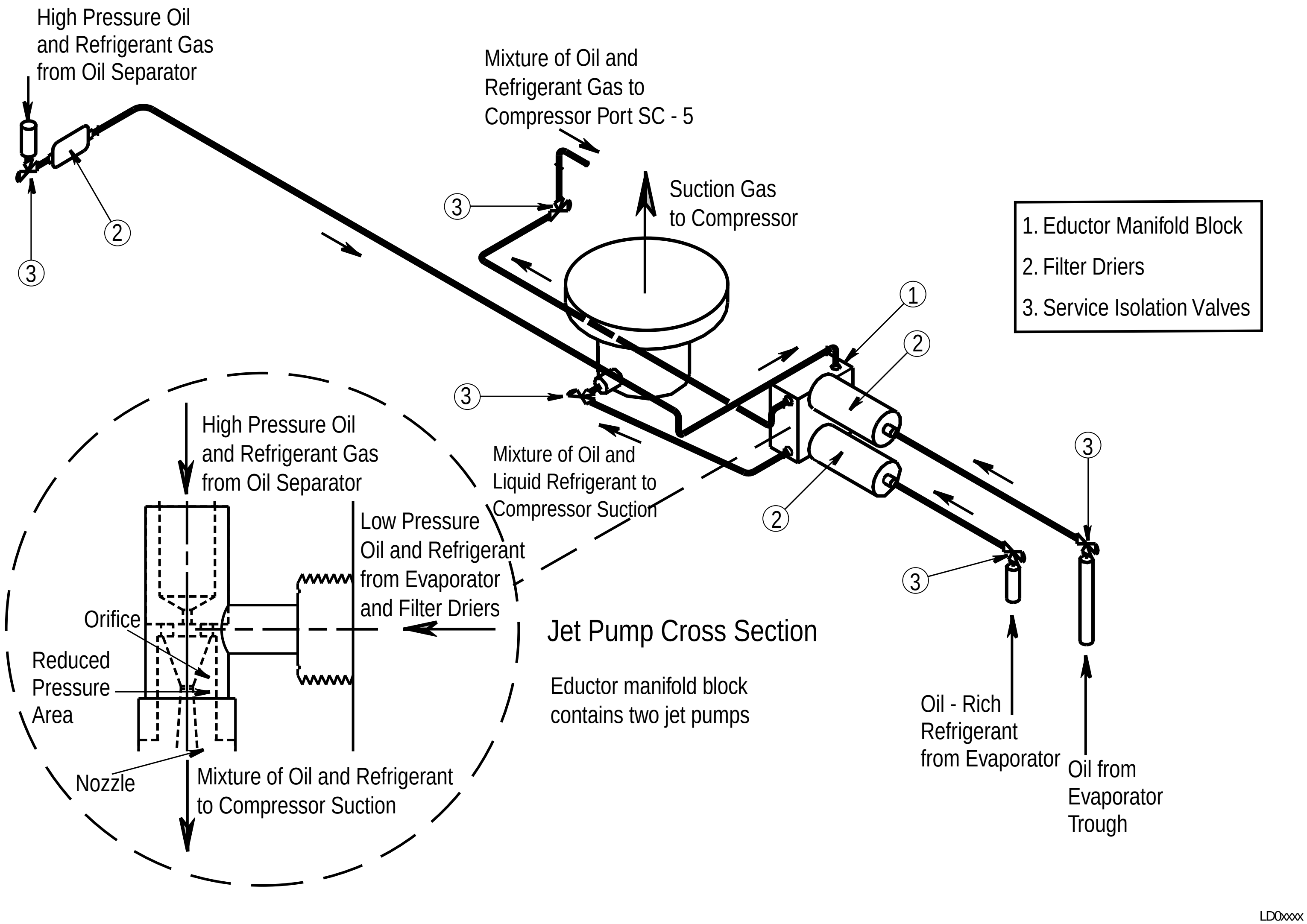

FIG. 21 – OIL EDUCTOR SCHEMATIC

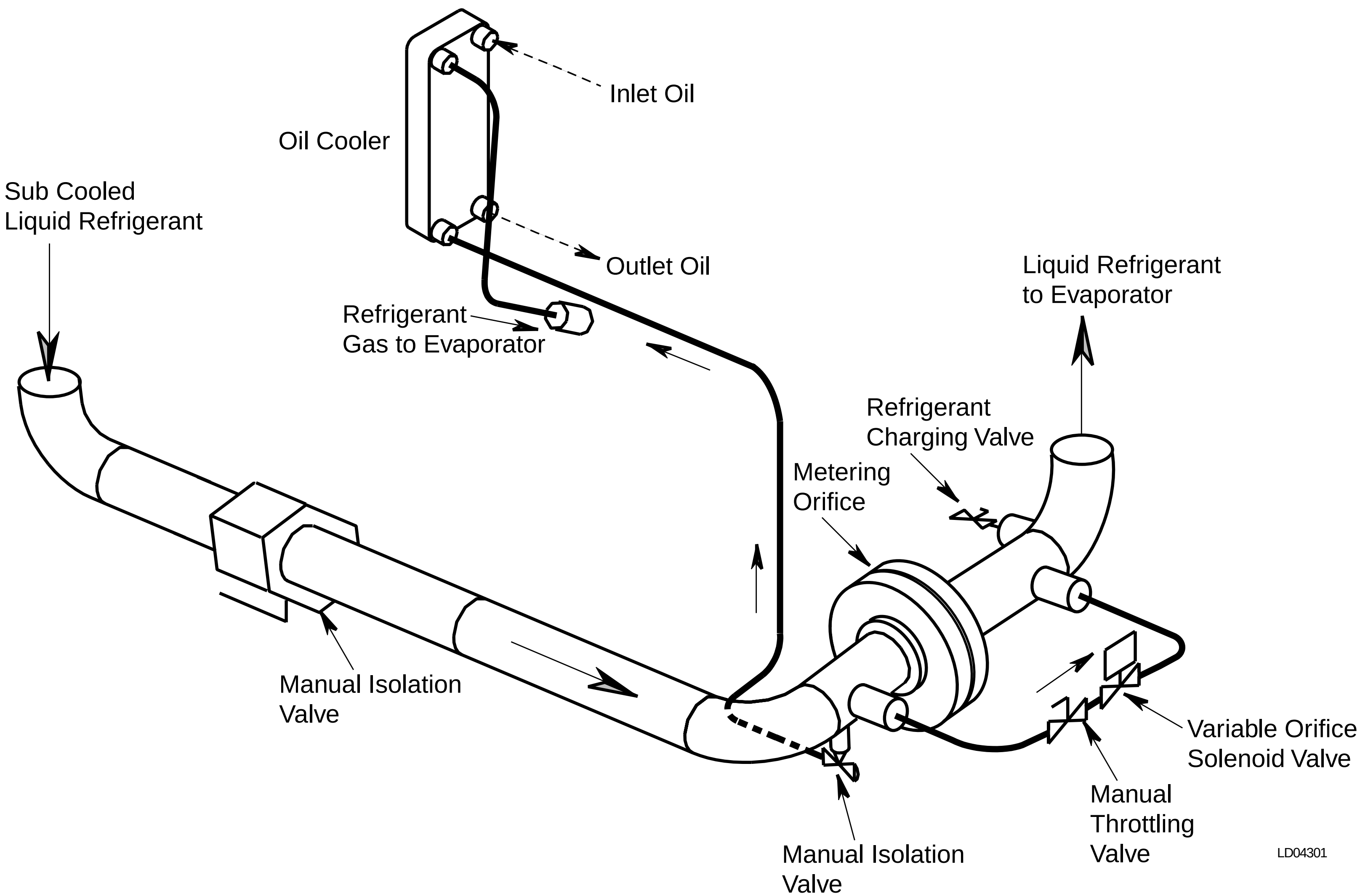

FIG. 22 – REFRIGERANT SCHEMATIC

CAPACITY CONTROL

Refer to the Capacity Control Piping Schematic piping, figure 23.

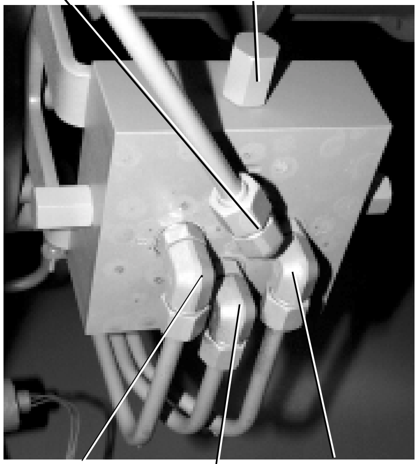

FIG. 24 – 4-WAY DIRECTIONAL VALVE SUBPLATE

Capacity control is accomplished by using differential pressure to move the slide valve. As the slide valve is moved axially between the compressor rotors the volume of gas pumped by the compressor is changed to match the system requirements.

Leaving evaporator fluid temperature is continuously monitored by the microprocessor. The Leaving Evaporator fluid temperature is compared to the Leaving Evaporator fluid Set Point. When the leaving evaporator fluid temperature is beyond the range of the set point value a signal is sent to the relay output board. A signal is sent from the relay output board to energize the 4-way valve directional solenoid valves.
When Solenoid Valve B is energized the slide valve begins to move in the load direction. The 4-way directional valve opens Port P to Port B and Port A to Port T. Oil pressure from the oil circuit flows into the 4-way solenoid valve sub-plate manifold at Port P. Oil pressure flows through the sub-plate manifold block and out Port B to Compressor Port SC-2. Simultaneously, oil flows out of Compressor Port SC-1 into Port A on the sub-plate manifold, through the sub-plate manifold block and out of the sub-plate manifold block at Port T to suction pressure.

When the Solenoid Valve A is energized, the slide valve will move in the unload direction. The 4-way directional valve opens Port P to Port A and Port B to Port T. See Figure 24. High pressure oil flows into Compressor Port SC-1 and oil is relieved out of Compressor Port SC-2 to suction pressure.

A slide valve potentiometer is used to provide feedback to the microprocessor to display slide valve position as a percentage of full load.

Four manual isolation valves are incorporated into the 4-way solenoid sub-plate to isolate the 4-way directional valve for service. Remove the steel hexagonal caps to gain access to the service valve stem. Use a refrigeration service valve wrench to close or open the valves.

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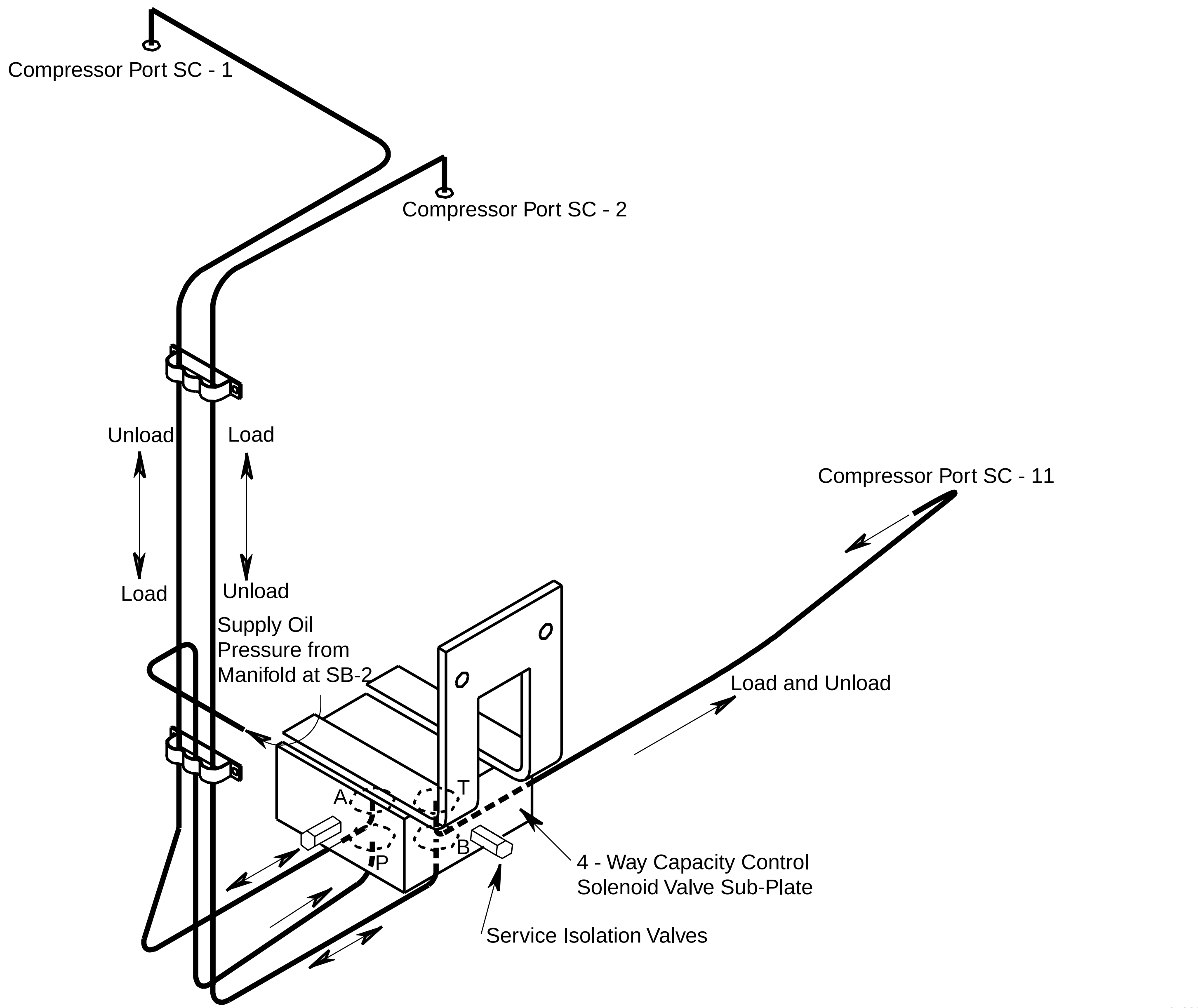

FIG. 23 – CAPACITY CONTROL PIPING SCHEMATIC

SECTION 3
MAINTENANCE

GENERAL

The maintenance requirements for YS Chillers is shown on the following page. The procedure is given in the left- hand column and the frequency required is marked with an “X” shown in the right-hand columns. Refer to the note at the bottom of the form to maintain warranty validation.

COMPRESSOR OIL

York oil types approved for YS Chillers and the quantity of oil required is listed in Table 6.

TABLE 6 – YORK OIL TYPES

CHILLER SIZE	R-22 OIL TYPE	R-134a OIL TYPE	SYSTEM QUANTITY (GAL)
S0	C	H	10
S1	C	H	10
S2	C	H	10
S3	P	H	10
S4	P	H	15
S5	P	H	15

York “C” Oil is a mineral oil. York “P” and “H” oil are polyolester (POE) oils. Polyolester oil is very hygroscopic and will absorb moisture from the atmosphere if it is not handled properly. Polyolester oil should be stored in metal containers. Plastic containers should not be used because they allow moisture to permeate into the oil.

Periodic oil analysis is recommended to verify the continued use of the compressor oil.

CAUTION

It is very important to take the oil sample after the oil filter. The slide valve cylinder has two pressure service ports that are ideal for drawing the oil sample. The oil sample should not be left open to the atmosphere for more than 15 minutes since it will absorb moisture from the atmosphere and may yield erroneous results.

Compressor oil should be changed when the oil analysis indicates the oil has moisture and acid numbers are in excess of the limits set in Table 7.

TABLE 7 – COMPRESSOR OIL LIMITS

YORK OIL TYPE	MOISTURE CONTENT (by Karl Fisher) ppm	TAN (Total Acid Number) mgKOH/ml
C	LESS THAN 50 PPM	LESS THAN 0.05
H	LESS THAN 300 PPM	LESS THAN 0.5
P	LESS THAN 300 PPM	LESS THAN 0.5

The York YS Chiller Compressors use rolling element bearings (ball and roller bearings); no sleeve bearings are used. Oil analysis that include metals may cause confusion when the results are compared to other equipment that utilize different bearing types. Iron and copper are examples of metals, which will appear in oil analysis that include metals. Other metals that may appear are Titanium, Zinc, Lead, Tin and Silicon. These metals should be ignored and are acceptable in quantities of less than 100 ppm. If a oil analysis should indicate high levels of Iron (more than 300 ppm) combined with Chromium and Nickel (more than 50 ppm) consult your local York Service Office, this could indicate bearing damage and wear.

The immersion oil heater will maintain the oil temperature between 105ºF (40ºC) and 115ºF (46ºC). The immersion oil heater is interlocked with the oil level float and will be de-energized when the oil level float drops to the low oil safety set point. See Figure 25.

CHANGING COMPRESSOR OIL

Compressor oil is changed by draining oil from the oil separator into a refrigerant recovery container. The oil separator is under positive pressure at ambient temperatures. Connect one end of a 5/8 inch refrigeration charging hose to the service valve located at the bottom of the oil separator; connect the other end to an approved refrigerant recovery cylinder. Open the valve and drain the oil from the oil separator.

Weigh the empty refrigerant recovery cylinder (compressor oil weighs 7 lb/gallon). Calculate the number of gallons of oil that has been removed from the oil separator by weighing the refrigerant recovery cylinders with the oil in them.

MAINTENANCE REQUIREMENTS FOR YORK YS CHILLERS

PROCEDURE	DAILY	WEEKLY	MONTHLY	QUARTERLY	YEARLY	EVERY 50,000 HOURS
Leak Check and Repair Leaks ***				X		
Perform Oil Analysis on Compressor Lube Oil ***					X	
Record Operating Pressures and Temperatures	X					
Calibrate Safety Controls					X	
Replace Oil Filters					X	
Replace Filters/Driers					X	
Check Slide Valve Operation and Calibrate Slide Valve Potentiometer					X	
Check Operation of Oil Heater			X			
Check Oil and Refrigerant Levels		X				
Lubricate Motor Bearings per Motor Manufacturer's Recommendation					X	
Megohm Motor					X	
Check 3-Phase Voltage and Current Balance				X		
Remove Condenser Water Box(s) and inspect tube sheets					X	
Mechanically Brush Condenser Tubes					X or as necessary	
Verify Evaporator and Condenser Water Flow Rates vs. Design Conditions					X	
Compressor Internal Inspection ***						X
Vibration Analysis					X	

*** These procedures must be performed at the specified time interval by an Industry Certified Technician, who has been trained and qualified to work on this type of YORK equipment. A record of this procedure being successfully carried out must be maintained on file by the equipment owner, should proof of adequate maintenance be required at a later date for warranty validation purposes.

Use a hand or electric oil pump to pump new oil into the oil separator. Pump oil into the oil separator until the oil is approximately half way in the upper sight glass. The amount of oil removed from the oil separator should equal the amount of new oil pumped into the oil separator.

OIL LEVEL

A visual check is sufficient to verify the oil level. Two sight glasses are part of the oil separator and should be used to determine the proper operating oil level.

The upper sight glass should have liquid oil visible in the sight glass with the chiller off and the oil at 105ºF (40ºC) and 115ºF (46ºC). When the chiller is in operation, the oil level may be different from the standby condition, due to the turbulence created by the discharge gas in the oil separator. See Figure 25.

OIL FILTER

A single oil filter is provided as standard equipment and dual oil filter arrangements are available as optional equipment. The oil filter(s) are a replaceable 3 micron cartridge type oil filter. Use only York approved oil filter elements. See Figure 17.

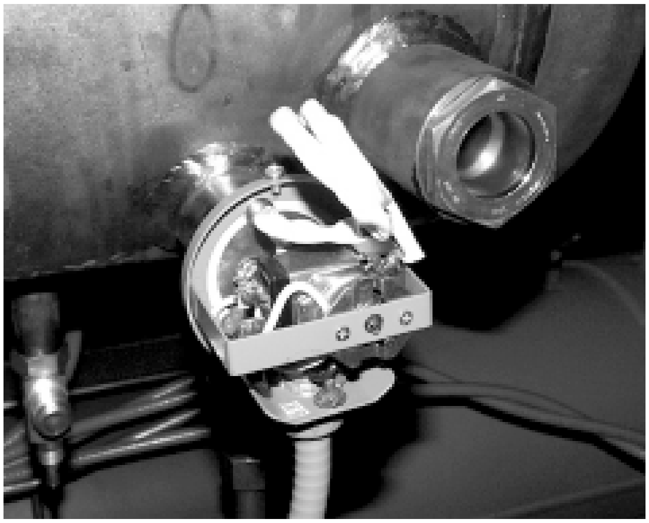

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FIG. 25 – OIL HEATER AND SIGHT GLASS

The oil filter element should be changed after the first 200 hours of operation and then as necessary thereafter. Change the oil filter element before the differential pressure reaches 20 psid.

The York control panel will automatically display the message "DIRTY OIL FILTER" when the differential pressure reaches 20 psid across the oil filter. A safety shutdown will be initiated if the oil pressure differential pressure reaches 25 psid. The control panel will display the message "CLOGGED OIL FILTER"

OIL FILTER REPLACEMENT

SINGLE OIL FILTER

The chiller must be OFF. Turn the rocker switch to the OFF position; turn the circuit breaker to the OFF position to prevent the chiller from being accidentally started.

1. Chiller sizes S0 – S3 have an oil stop solenoid valve on the inlet supply oil line ahead of the oil filter. This valve will be automatically closed when the chiller is turned off.

   Chiller sizes S4 and S5 have a hand isolation valve on the inlet oil line to the oil filter. Close this valve.
2. Close the hand isolation valve located in the oil line on the outlet of the oil filter.
3. Relieve the refrigerant pressure and oil in the oil filter and the oil lines through the pressure access port fitting, located on the top of the filter housing. Connect a refrigeration pressure hose to the pressure access port and drain the oil and refrigerant into a suitable refrigerant recovery container.
4. Position a container to collect the oil (less than 2 quarts, 1.9 liters). Loosen and remove the drain nut at the bottom of the oil filter housing; drain the oil into the container.
5. Unscrew the oil filter bowl.
6. Remove the oil filter element.
7. Install a new element.
8. Install a new O-ring on the top of the oil filter bowl.
9. Tighten the oil filter bowl.
10. Evacuate the air from the oil filter to 500 microns psig.
11. Open the hand isolation valves.
12. The chiller is ready to be restarted.

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DUAL OIL FILTERS

The dual oil filter option allows one oil filter to be isolated and changed with the chiller in operation.

1. Open the hand isolation valves on the idle filter.
2. Close the hand isolation valves on the filter to be changed.

3. Follow the instructions for changing the single oil filter beginning at step #3.
4. This can now be the idle filter and the chiller can be operated with the current oil filter.

FILTER DRIER REPLACEMENT

The filter driers should be changed annually or when excessive amount of oil is indicated in the refrigerant charge.

When the filter driers require changing the chiller must be shut off.

1. Close the (5) hand isolation valves identified in schematic drawing, Figure 22.
2. Carefully remove the insulation on the (2) filter driers located on the eductor block.
3. Relieve the pressure from the circuit using the pressure access fitting located on the side of the eductor block. Connect a refrigeration pressure hose to the pressure access port and drain the oil and refrigerant into a suitable refrigerant recovery container.
4. Loosen the Rota-Lock® Nuts at each end of the (3) filter driers. Remove the filter driers.
5. Teflon® seal washers are used to seal the filter drier connections. These washers must be replaced when the filter driers are replaced.
6. Tighten the Rota-Lock® Nuts at each end of the three filter driers to a torque of 60 ft-lb.
7. Evacuate the air from the oil filter to 500 microns psig.
8. Open the five hand isolation valves. The chiller is now ready to be placed back into service.

MOTOR

Inspect the motor at regular intervals. Keep the motor clean and vent openings clear. Follow the original motor manufacturer recommendation for lubricating the motor bearings. If the chiller is exposed to dusty and dirty conditions during installation, lubricate the motor bearings ahead of the suggested schedule.

DETERMINING CORRECT REFRIGERANT CHARGE LEVEL

The refrigerant charge level is correct when the measured evaporator approach and discharge refrigerant gas superheat are within the values listed in Table 8.

IMPORTANT
The chiller must be at design operating conditions and full load operation before the correct refrigerant charge level can be properly determined.

TABLE 8 – REFRIGERANT CHARGE LEVEL

CONDITION	R-22 REFRIGERANT	R-134a REFRIGERANT
COMFORT COOLING APPLICATIONS		
EVAPORATOR APPROACH	1-3°F	1-3°F
DISCHARGE SUPERHEAT	35-45°F	12-18°F
BRINE (ICE MAKING) APPLICATIONS		
EVAPORATOR APPROACH	6-8°F	6-8°F
DISCHARGE SUPERHEAT	50-65°F	24-36°F

Liquid refrigerant will be visible in the evaporator sight glass. The refrigerant level cannot be properly determined by viewing the liquid refrigerant level in the evaporator sight glass.

All YS Chillers shipped Form 1 are charged with the correct amount of liquid refrigerant. Under some operating conditions the chiller may appear to be overcharged with liquid refrigerant. Consult with the York Factory prior to removing refrigerant. The liquid line isolation valve may have to be partially throttled to prevent overfeeding the evaporator in some applications and under certain operating conditions.

Definitions:

Evaporator Approach = (S.E.T) - (L.E.L.T)
Discharge Superheat = (C.D.G.T) - (S.C.T)

Where:

S.E.T. = Saturated Evaporator Temperature
L.E.L.T. = Leaving Evaporator Liquid Temperature
C.D.G.T. = Compressor Discharge Gas Temperature
S.C.T. = Saturated Condensing Temperature

RERIGERANT CHARGING

Should it become necessary to add refrigerant charge to a York YS Chiller; add charge until the evaporator approach and refrigerant gas discharge superheat are at within the values listed in Table 8.

A charging valve is located in the liquid line below the evaporator. The size of the charging connection is ¾ inch male flare. Purge air and non-condensables from the charging hose. Only add new refrigerant or reclaimed refrigerant that has been tested and verified to meet ARI 700.

REFRIGERANT LEAK CHECKING

Periodic refrigerant leak checking must be part of a comprehensive maintenance program. Leak check the entire chiller using a calibrated electronic leak detector.

Confirm leaks with soap bubbles that are found using the electronic leak detector.

Check refrigerant relief valve piping and tube rolled joints as part of the comprehensive refrigerant leak checking program.

Repair leaks before adding refrigerant.

PRESSURE CONNECTIONS

All threaded pressure connections used on the York YS Chillers are SAE straight thread, O-ring face seal type fittings or Primore Rotalock® fittings.

The O-ring straight thread fittings and O-ring face seal fittings are designed and used in accordance with SAE J1926 and J1453. Should it become necessary to remove a fitting the O-ring(s) should be replaced. Make certain to use only neoprene replacement O-rings. O-rings can be ordered from the local York Service Office.

Pipe sealant compounds are not required with SAE type O-ring fittings. The O-ring seal accomplishes the pressure sealing. Lubricate the O-ring with compressor oil prior to assembly.

All filter driers and angle shut off valves use Primore Rotalock® fittings. These fittings use a Teflon® fiber seal washer. The Teflon® fiber seal washers should be replaced each time the filter driers are changed.

CONDENSER TUBES

The standard condenser tubes used in York YS Chillers are internally enhanced copper tubes.

CAUTION

If the equipment is located in an unheated area that is susceptible to freezing, the water must be drained from the condenser to prevent tube failure from freezing.

Proper condenser water treatment can eliminate or significantly reduce the formation of scale on the waterside of the condenser tubes.

Maintain a minimum condenser water flow rate of at least 3.33 ft/sec. Water velocity should not exceed 12 ft/sec.

Condenser tubes must be maintained to provide proper chiller operation. Condenser Approach Temperature is a useful tool to monitor the performance of the condenser. By recording and logging the Condenser Approach Temperature as part of the chiller maintenance program, this will provide a warning that the waterside condenser tubes are fouled and require cleaning.

Condenser Approach Temperature is the difference between the Condenser Leaving Water Temperature and the Saturated Condensing Temperature.

If the approach increases above 10ºF (5.6ºC), or during the annual condenser inspection and the tubes are observed to be fouled, the tubes will require cleaning. For condenser fluids other than water consult with the local York Field Service Office for the correct condenser approach.

CONDENSER WATER SIDE TUBE CLEANING PROCEDURE

Two methods are used for waterside tube cleaning to remove the scale; chemical and mechanical cleaning procedures. The composition of the scale will determine which method will be most effective to remove the scale and dirt.

Consult with the local York Field Service Office for a recommendation of the method(s) used in the local area.

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CHEMICAL CLEANING PROCEDURE

Chemical cleaning is an effective method to remove scale from internally enhanced copper tubes. However, a company knowledgeable with the chemical cleaning procedure should be contracted or consulted. Follow the chemical cleaning company recommendations concerning solution cleaning strength and time duration of the cleaning process.

CAUTION

Serious damage to the condenser tubes will result if the chemical cleaning procedure is improperly applied.

NOTE

Mechanical tube cleaning must always follow a chemical cleaning procedure.

When chemical cleaning of the condenser tubes is required it may be necessary to calculate the internal volume of the waterside condenser tubes. This information is necessary to properly mix the correct concentration of cleaning solution.

Standard materials of construction for York YS Chiller condensers is copper tubes and mild carbon steel water boxes.

The internal volume (waterside) of the condenser can be calculated as follows:
Volume (in^3) = N * L * 0.30680 in^3/in

Where: N = Number of Condenser Tubes
L = Length of each tube in inches
To covert in^3 to gallons, divide the Volume (in^3) by 231 in^3/gallon

MECHANICAL CLEANING PROCEDURE

1. Drain the water from the condenser
2. Remove the water boxes from both ends of the condenser. Use proper lifting equipment when removing the water boxes. Use caution not to damage the threads on the mounting studs that are welded to the tube sheet.
3. Select a tube cleaning brush for 5/8 inch I.D copper condenser tubes. If tubes other than 5/8 inch copper are used, select a tube cleaning brush that is made for the tube size. Generally, brushes made of hard plastic or brass bristled wires are preferred for cleaning copper tubes.
4. Attach the tube cleaning brush to the end of a cleaning machine or cleaning rod.
5. Flush the condenser with clean water to remove the debris.
6. Replace the water box gasket and reassemble the water boxes onto the condenser.

EVAPORATOR TUBES

The standard evaporator tubes used in York YSChillers are internally enhanced copper tubes.

CAUTION

If the equipment is located in an unheated area that is susceptible to freezing, the water must be drained from the evaporator to prevent tube damage from freezing.

Maintain evaporator water or brine flow rates through the evaporator tubes that the chiller was designed for. Refer to the engineering data on the sales order form for the correct flow rates.

The maximum and minimum water flow velocities are listed in Table 9.

If cleaning of the evaporator tubes is required, follow the condenser cleaning procedure.

TABLE 9 – WATER FLOW VELOCITIES

FLUID	WATER	BRINE
MINIMUM FLUID* VELOCITY FEET/SEC. (METERS/SEC.)	3.33 (1.0)	4.5 (1.37)
MAXIMUM FLUID VELOCITY FEET/SEC. (METERS/SEC.)	12.0 (3.6)	12.0 (3.6)

Generally, the water or brine that is circulated through the evaporator is part of closed loop circuit that is treated with chemicals to prevent the formation of scale and debris.

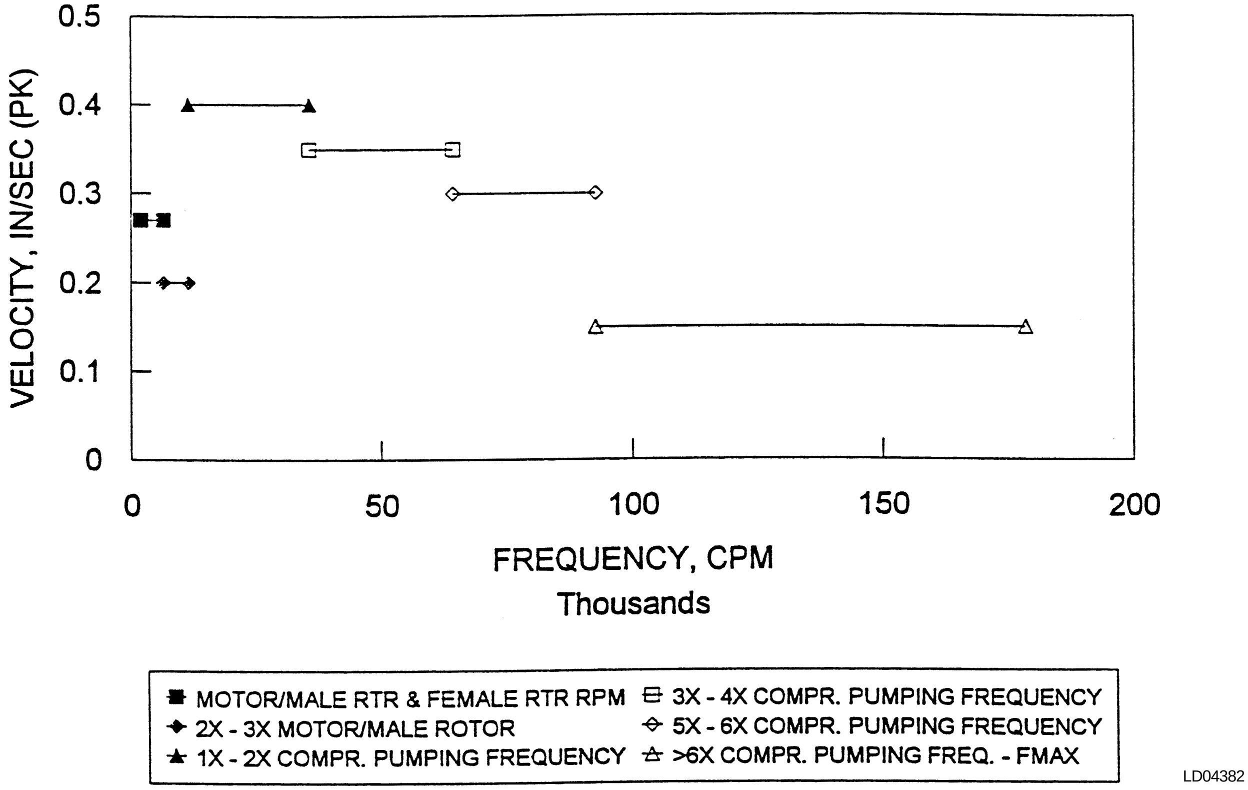
* Consult the York Factory Order Form for the specific minimum velocity based upon the type of brine and concentration being used.

VIBRATION ANALYSIS

Vibration analysis performed at regular intervals is a useful diagnostic tool that can detect internal damage to rotating machinery and component parts. This service should be performed by a skilled technician trained in the use and operation of the equipment. Fig. 26 is provided to properly locate the transducer measurement points. Locating the transducers at these locations will enable the data to be analyzed against a large database of sound and vibration data.

Note the natural or pumping frequency of the York YS compressor is 238 HZ at 60 HZ and 198 HZ at 50 HZ.

SPECTRAL ALARM BANDS FOR 4/6 LOBE TWIN SCREW CHILLERS
(YS___S0 through S5 YORK Screw Chillers)



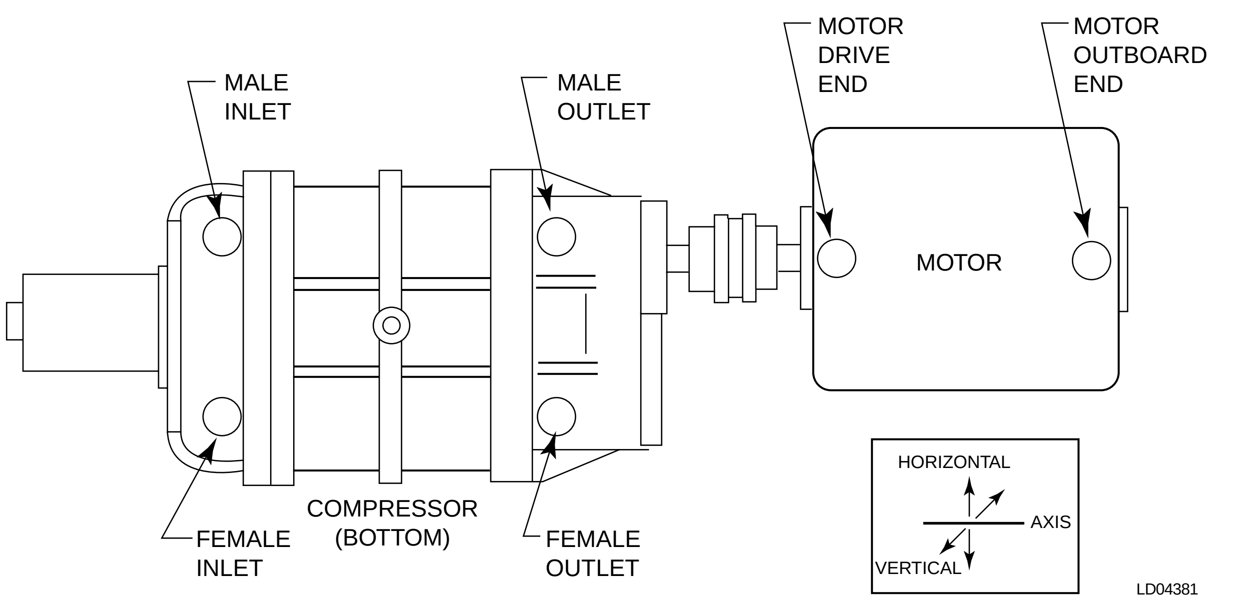


FIG. 26 – TRANSDUCER MEASUREMENT POINTS

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SPECTRAL ALARM BANDS FOR 4/6 LOBE TWIN SCREW CHILLERS (Cont'd)

(YS___S0 through S5 YORK Screw Chillers)

Reference: Proven method for specifiying spectral band alarm levels and frequencies using today's predictive maintenance software systems
James E. Berry, Technical Associates of Charlotte, Inc.

OVERALL LEVEL	OA	0.500	IN/SEC (0-PK)		
MTR/MALE RTR RPM	MTR	3570	RPM =	59.5	Hz
4/6 LOBE RATIO	LR	0.67			
FEMALE ROTOR	IDLE	2380	RPM =	39.7	Hz
MALE ROTOR LOBES	LOB	4			
PUMPING FREQUENCY	BPF	14280	CPM =	238.0	Hz
FREQUENCY MAX	FMAX	178500	CPM =	2,975.0	Hz

ITEM	BAND 1	BAND 2	BAND 3	BAND 4	BAND 5	BAND 6
BAND LOWER FREQ., CPM	1,904	6,426	11,424	35,700	64,260	92,820
BAND UPPER FREQ., CPM	6,426	11,424	35,700	64,260	92,820	178,500
BAND LOWER FREQ., Hz	32	107	190	595	1,071	1,547
BAND UPPER FREQ., Hz	107	190	595	1,071	1,547	2,975
BAND ALARM LEVEL	0.27	0.2	0.4	0.35	0.3	0.15

DESCRIPTION OF BAND COVERAGE

BAND 1	MOTOR/MALE RTR & FEMALE RTR RPM
BAND 2	2X - 3X MOTOR/MALE ROTOR
BAND 3	1X - 2X COMPR. PUMPING FREQUENCY
BAND 4	3X - 4X COMPR. PUMPING FREQUENCY
BAND 5	5X - 6X COMPR. PUMPING FREQUENCY
BAND 6	>6X COMPR. PUMPING FREQUENCY - FMAX.

NOTES:

1. Assume measurements by accelerometer or velocity pickup as close as possible to Bearing Housing, see Fig. 26.
2. Assume machine NOT mounted on vibration isolators (for isolated machinery - set alarm levels 50% higher).
3. Set motor levels same as compressor given above.
4. Chiller must be at a consistent condition (not only motor amps) when measurements are taken. Monitor and record all performance parameters.
5. Aerodynamic noise (pressure pulsation) sources dominate mechanical sources at pumping frequency and harmonics and does not represent energy transmitted through bearings.
6. Set danger levels 50% higher than alarm levels.
7. Another set of data with much higher Fmax can be used to detect additional stages of bearing failure using techniques described in Preventative Maintenance literature.

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P.O. Box 1592, York, Pennsylvania USA 17405-1592

Form 160.47-NOM3 (599)
Supersedes: Nothing