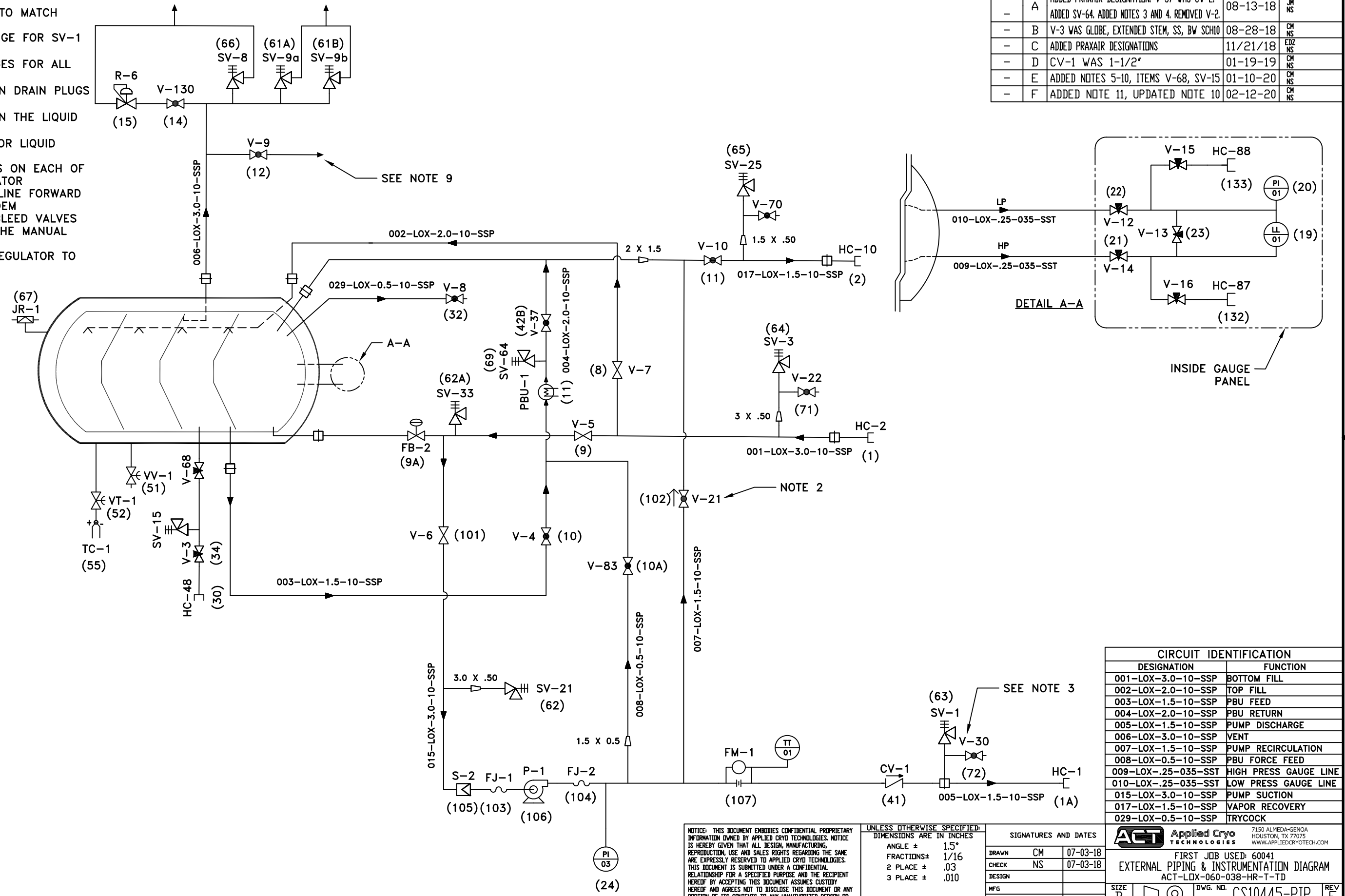


- NOTES:
1. TRYCOCK TO BE PIPED THROUGH THE DRIP PAN.
 2. VALVE ORIENTATION TO MATCH SCHEMATIC
 3. DRILL AND TAP FLANGE FOR SV-1 (63) & V-30 (72)
 4. INSTALL 150# FLANGES FOR ALL CGA CONNECTIONS
 5. DRILL 1/4" HOLES IN DRAIN PLUGS ON VENT LINE
 6. DRILL 1/8" HOLES IN THE LIQUID SAMPLE PLUG
 7. USE 1/4" TUBING FOR LIQUID SAMPLE
 8. INSTALL PIPE UNIONS ON EACH OF ROAD RELIEF REGULATOR
 9. PIPE MANUAL VENT LINE FORWARD AHEAD OF THE TANDEM
 10. ALL SAFETIES AND BLEED VALVES TO BE ROUTED TO THE MANUAL VENT STACK
 11. PIPE ROAD RELIEF REGULATOR TO THE VENT STACK



ZONE	REV	DESCRIPTION	DATE	APPROVED
-	-	INITIAL RELEASE	07-03-18	CM NS
-	A	ADDED PRAXAIR DESIGNATION. V-37 WAS CV-2. ADDED SV-64. ADDED NOTES 3 AND 4. REMOVED V-2.	08-13-18	JM NS
-	B	V-3 WAS GLOBE, EXTENDED STEM, SS, BW SCH10	08-28-18	CM NS
-	C	ADDED PRAXAIR DESIGNATIONS	11/21/18	EDZ NS
-	D	CV-1 WAS 1-1/2"	01-19-19	CM NS
-	E	ADDED NOTES 5-10, ITEMS V-68, SV-15	01-10-20	CM NS
-	F	ADDED NOTE 11, UPDATED NOTE 10	02-12-20	CM NS

CIRCUIT IDENTIFICATION	
DESIGNATION	FUNCTION
001-LOX-3.0-10-SSP	BOTTOM FILL
002-LOX-2.0-10-SSP	TOP FILL
003-LOX-1.5-10-SSP	PBU FEED
004-LOX-2.0-10-SSP	PBU RETURN
005-LOX-1.5-10-SSP	PUMP DISCHARGE
006-LOX-3.0-10-SSP	VENT
007-LOX-1.5-10-SSP	PUMP RECIRCULATION
008-LOX-0.5-10-SSP	PBU FORCE FEED
009-LOX-.25-035-SST	HIGH PRESS GAUGE LINE
010-LOX-.25-035-SST	LOW PRESS GAUGE LINE
015-LOX-3.0-10-SSP	PUMP SUCTION
017-LOX-1.5-10-SSP	VAPOR RECOVERY
029-LOX-0.5-10-SSP	TRYCOCK

NOTICE: THIS DOCUMENT EMBODIES CONFIDENTIAL PROPRIETARY INFORMATION OWNED BY APPLIED CRYO TECHNOLOGIES. NOTICE IS HEREBY GIVEN THAT ALL DESIGN, MANUFACTURING, REPRODUCTION, USE AND SALES RIGHTS REGARDING THE SAME ARE EXPRESSLY RESERVED TO APPLIED CRYO TECHNOLOGIES. THIS DOCUMENT IS SUBMITTED UNDER A CONFIDENTIAL RELATIONSHIP FOR A SPECIFIED PURPOSE AND THE RECIPIENT HEREOF BY ACCEPTING THIS DOCUMENT ASSUMES CUSTODY HEREOF AND AGREES NOT TO DISCLOSE THIS DOCUMENT OR ANY PORTION OF ITS CONTENTS TO ANY UNAUTHORIZED PERSON OR TO INCORPORATE THIS PROPRIETARY DESIGN OR THE SUBSTANCE OF IT EITHER IN WHOLE OR IN PART IN ANY OTHER PROJECTS.

UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES
 ANGLE ± 1.5°
 FRACTIONS ± 1/16
 2 PLACE ± .03
 3 PLACE ± .010

SIGNATURES AND DATES		
DRAWN	CM	07-03-18
CHECK	NS	07-03-18
DESIGN		
MFG		
Q.A.		
APPROVED	NS	07-03-18

ACT Applied Cryo TECHNOLOGIES 7150 ALMEDA-GENOA HOUSTON, TX 77075 WWW.APPLIEDCRYOTECH.COM

FIRST JOB USED: 60041
 EXTERNAL PIPING & INSTRUMENTATION DIAGRAM
 ACT-LOX-060-038-HR-T-TD

SIZE B DWG. NO. CS10445-PIP REV F

WEIGHT # SCALE - SHEET 1 OF 2

ZONE	REV	DESCRIPTION	DATE	APPROVED
-	-	INITIAL RELEASE	07-03-18	CM NS

51	VV-1	MAIN VACUUM VALVE	1-1/2"	VALVE, DIAPHRAM, FNPT
52	VT-1	THERMOCOUPLE ISOLATION VALVE	1/8"	VALVE, BELLOWS, NPT, SEALED
14	V-130	ROAD RELIEF VALVE	1/2"	VALVE, GLOBE, EXTENDED STEM, SS, BW SCH10
10A	V-83	PB FORCE FEED	1/2"	VALVE, GLOBE, EXTENDED STEM, SS, BW SCH10
-	V-70	VAPOR RECOVERY BLEED VALVE	1/2"	VALVE, GLOBE, EXTENDED STEM, SS, BW SCH10
-	V-68	LIQUID SAMPLE ISOLATION VALVE	1/4"	VALVE, NEEDLE, SS, TUBE X TUBE
42B	V-37	PB OUTLET VALVE	2"	VALVE, GLOBE, EXTENDED STEM, SS, BW SCH10
72	V-30	DISCHARGE LINE BLEED VALVE	1/2"	VALVE, GLOBE, EXTENDED STEM, SS, BW SCH10
71	V-22	FILL & DRAIN BLEED VALVE	1/2"	VALVE, GLOBE, EXTENDED STEM, SS, BW SCH10
102	V-21	PUMP RECIRCULATION VALVE	1-1/2"	VALVE, GLOBE, EXTENDED STEM, SS, BW SCH10
-	V-16	HIGH PRESSURE VALVE	1/4"	VALVE, NEEDLE, SS, TUBE X TUBE
-	V-15	LOW PRESSURE VALVE	1/4"	VALVE, NEEDLE, SS, TUBE X TUBE
21	V-14	HIGH PRESSURE ISOLATION VALVE	1/4"	VALVE, NEEDLE, SS, TUBE X TUBE
23	V-13	EQUALIZATION VALVE	1/4"	VALVE, NEEDLE, SS, TUBE X TUBE
22	V-12	LOW PRESSURE ISOLATION VALVE (REAR)	1/4"	VALVE, NEEDLE, SS, TUBE X TUBE
11	V-10	VAPOR RECOVERY VALVE	1-1/2"	VALVE, GLOBE, EXTENDED STEM, SS, BW SCH10
12	V-9	MANUAL VENT VALVE	1-1/2"	VALVE, GLOBE, EXTENDED STEM, SS, BW SCH10
32	V-8	FULL TRYCOCK VALVE (LOX)	1/2"	VALVE, GLOBE, EXTENDED STEM, SS, BW SCH10
8	V-7	TOP FILL VALVE	2"	VALVE, GATE, EXTENDED STEM, SS, BW SCH10
101	V-6	PUMP SUCTION VALVE	3"	VALVE, GATE, EXTENDED STEM, SS, BW SCH10
9	V-5	FILL & DRAIN VALVE	3"	VALVE, GATE, EXTENDED STEM, SS, BW SCH10
10	V-4	PRESSURE BUILDING VALVE	1-1/2"	VALVE, GLOBE, EXTENDED STEM, SS, BW SCH10
34	V-3	LIQUID SAMPLE VALVE	1/2"	VALVE, NEEDLE, SS, TUBE X TUBE, SWAGelok
-	TT-01	PUMP COOL DOWN TEMPERATURE SENSOR	1/2"	SENSOR, TEMP, RTD, MNPT, PROVIDED W/ FM-1
55	TC-1	HASTINGS THERMOCOUPLE	N/A	THERMOCOUPLE, DV-6S
69	SV-64	PB OUTLET RELIEF VALVE	1/2"	VALVE, RELIEF, THERMAL, NO WEEP, SET @ 100 PSI, MNPT
62A	SV-33	FILL AND DRAIN RELIEF VALVE	1/2"	VALVE, RELIEF, THERMAL, NO WEEP, SET @ 100 PSI, MNPT
65	SV-25	VAPOR RECOVERY RELIEF VALVE	1/2"	VALVE, RELIEF, THERMAL, NO WEEP, SET @ 100 PSI, MNPT
62	SV-21	PUMP SUCTION RELIEF VALVE	1/2"	VALVE, RELIEF, THERMAL, NO WEEP, SET @ 100 PSI, MNPT
-	SV-15	SAMPLE RELIEF VALVE	1/4"	VALVE, RELIEF, THERMAL, NO WEEP, SET @ 100 PSI, MNPT
61A	SV-9a	SECONDARY INNER VESSEL RELIEF VALVE	2" X 2"	VALVE, RELIEF, THERMAL, NO WEEP, SET @ 42 PSI, MNPT
61B	SV-9b	SECONDARY INNER VESSEL RELIEF VALVE	2" X 2"	VALVE, RELIEF, THERMAL, NO WEEP, SET @ 42 PSI, MNPT
66	SV-8	PRIMARY INNER VESSEL RELIEF VALVE	2" X 2"	VALVE, RELIEF, THERMAL, NO WEEP, SET @ 38 PSI, MNPT
64	SV-3	FILL & DRAIN RELIEF VALVE	1/2"	VALVE, RELIEF, THERMAL, NO WEEP, SET @ 100 PSI, MNPT
63	SV-1	DISCHARGE RELIEF VALVE	1/2"	VALVE, RELIEF, THERMAL, NO WEEP, SET @ 450 PSI, MNPT
105	S-2	PUMP SUCTION STRAINER	3"	STRAINER, CONE, MONEL 40 MESH SCREEN, COMPRESSION
15	R-6	ROAD RELIEF REGULATOR	1/2"	REGULATOR, PRESSURE, SET @ 15 PSI
24	PI-3	PUMP PRESSURE GAUGE	1/4"	GAUGE, PRESSURE, 4-1/2" DIAL, 0-600 PSI, MNPT
20	PI-1	INNER VESSEL PRESSURE GAUGE	1/4"	GAUGE, PRESSURE, 4-1/2" DIAL, 0-60 PSI, MNPT
11	PBU-1	PRESSURE BUILDING UNIT	1-1/2" X 2"	TANK PRESSURE BUILDER
106	P-1	CRYO PUMP	3.0" X 1.5" X 10.5"	PUMP, CENTRIFUGAL, HYDRAULIC DRIVEN
19	LL-1	LIQUID LEVEL GAUGE	1/4"	GAUGE, PRESSURE DIFF, 6" DIAL, 0-100 W.C., FNPT
67	JR-1	JACKET VACUUM RELIEF	7"	RELIEF, O-RING
133	HC-88	LOW PRESSURE CONNECTION	1/4"	CONNECTOR, QUICK CONNECT, MNPT
132	HC-87	HIGH PRESSURE CONNECTION	1/4"	CONNECTOR, QUICK CONNECT, MNPT
30	HC-48	SAMPLE CONNECTION	-	CGA 540
2	HC-10	VAPOR RECOVERY HOSE CONNECTION	1-1/2"	FIXED END, LOX CGA
1	HC-2	FILL & DRAIN HOSE CONNECTION	3"	FIXED END, LOX CGA
1A	HC-1	DISCHARGE HOSE CONNECTION	1-1/2"	FIXED END, LOX CGA
107	FM-1	DISCHARGE FLOW METER	2" TUBE	METER, FLOW, TURBINE
104	FJ-2	FLEX JOINT	1-1/2"	HOSE, FLEX, SS, BRAIDED, #300
103	FJ-1	FLEX JOINT	3"	HOSE, FLEX, SS, BRAIDED, #150
9A	FB-2	FILL & DRAIN FIRE BLOCK VALVE	3"	VALVE, GATE, AIR, AIR ACTUATED, REMOTE CONTROLLED, SELF CLOSING SHUT OFF VALVE
41	CV-1	DISCHARGE CHECK VALVE	2"	VALVE, SPRING CHECK, SS, FLANGED, 300#, CHECK ALL

LEGEND:

- = HOSE CONNECTION
- = CONCENTRIC REDUCER
- = FLANGED CONNECTION
- = GLOBE VALVE
- = CHECK VALVE
- = FIRE BLOCK VALVE
- = REGULATOR
- = RUPTURE DISC
- = FIRE BLOCK VALVE
- = ACTUATED VALVE
- = BALL VALVE
- = STRAINER
- = DIAPHRAGM VALVE
- = NEEDLE VALVE
- = THERMOCOUPLE
- = RELIEF VALVE
- = GATE VALVE
- = ACTUATED VALVE
- = FLOW METER

<p>NOTICE: THIS DOCUMENT EMBODIES CONFIDENTIAL PROPRIETARY INFORMATION OWNED BY APPLIED CRYO TECHNOLOGIES. NOTICE IS HEREBY GIVEN THAT ALL DESIGN, MANUFACTURING, REPRODUCTION, USE AND SALES RIGHTS REGARDING THE SAME ARE EXPRESSLY RESERVED TO APPLIED CRYO TECHNOLOGIES. THIS DOCUMENT IS SUBMITTED UNDER A CONFIDENTIAL RELATIONSHIP FOR A SPECIFIED PURPOSE AND THE RECIPIENT HEREOF BY ACCEPTING THIS DOCUMENT ASSUMES CUSTODY HEREOF AND AGREES NOT TO DISCLOSE THIS DOCUMENT OR ANY PORTION OF ITS CONTENTS TO ANY UNAUTHORIZED PERSON OR TO INCORPORATE THIS PROPRIETARY DESIGN OR THE SUBSTANCE OF IT EITHER IN WHOLE OR IN PART IN ANY OTHER PROJECTS.</p>	<p>UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES</p> <p>ANGLE ± 1.5° FRACTIONS ± 1/16 2 PLACE ± .03 3 PLACE ± .010</p>	SIGNATURES AND DATES		<p>7150 ALMEDA-GENOA HOUSTON, TX 77075 WWW.APPLIEDCRYOTECH.COM</p> <p>FIRST JOB USED: 60041 EXTERNAL PIPING & INSTRUMENTATION DIAGRAM ACT-LOX-060-038-HR-T-TD</p>
		<p>DRAWN CM 07-03-18</p> <p>CHECK NS 07-03-18</p> <p>DESIGN</p> <p>MFG</p> <p>QA</p> <p>APPROVED NS 07-03-18</p>	<p>SIZE B</p> <p>WEIGHT #</p> <p>SCALE -</p> <p>SHEET 2 OF 2</p>	