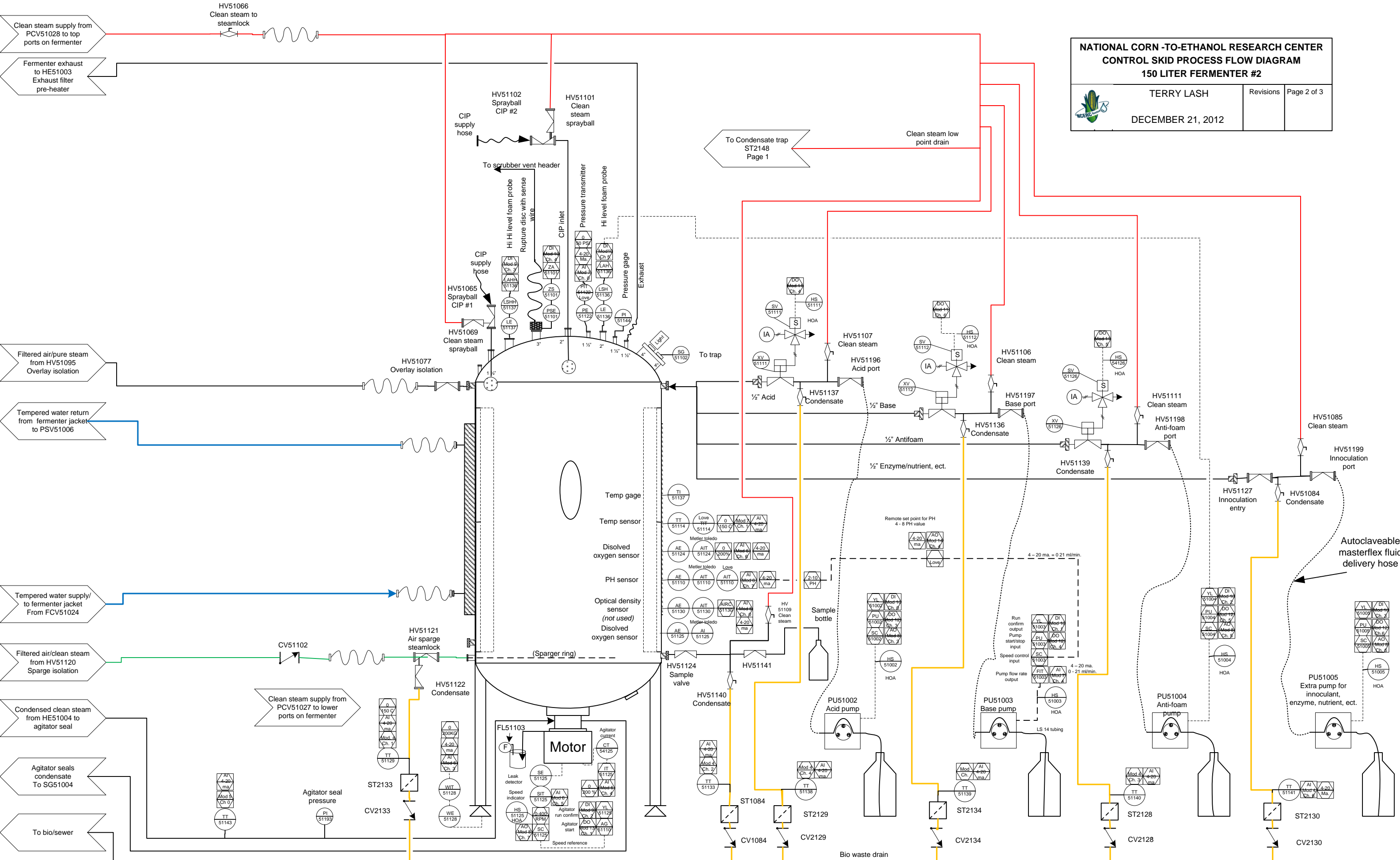


**NATIONAL CORN -TO-ETHANOL RESEARCH CENTER  
CONTROL SKID PROCESS FLOW DIAGRAM  
150 LITER FERMENTER #2**

TERRY LASH  
Revisions  
Page 1 of 5

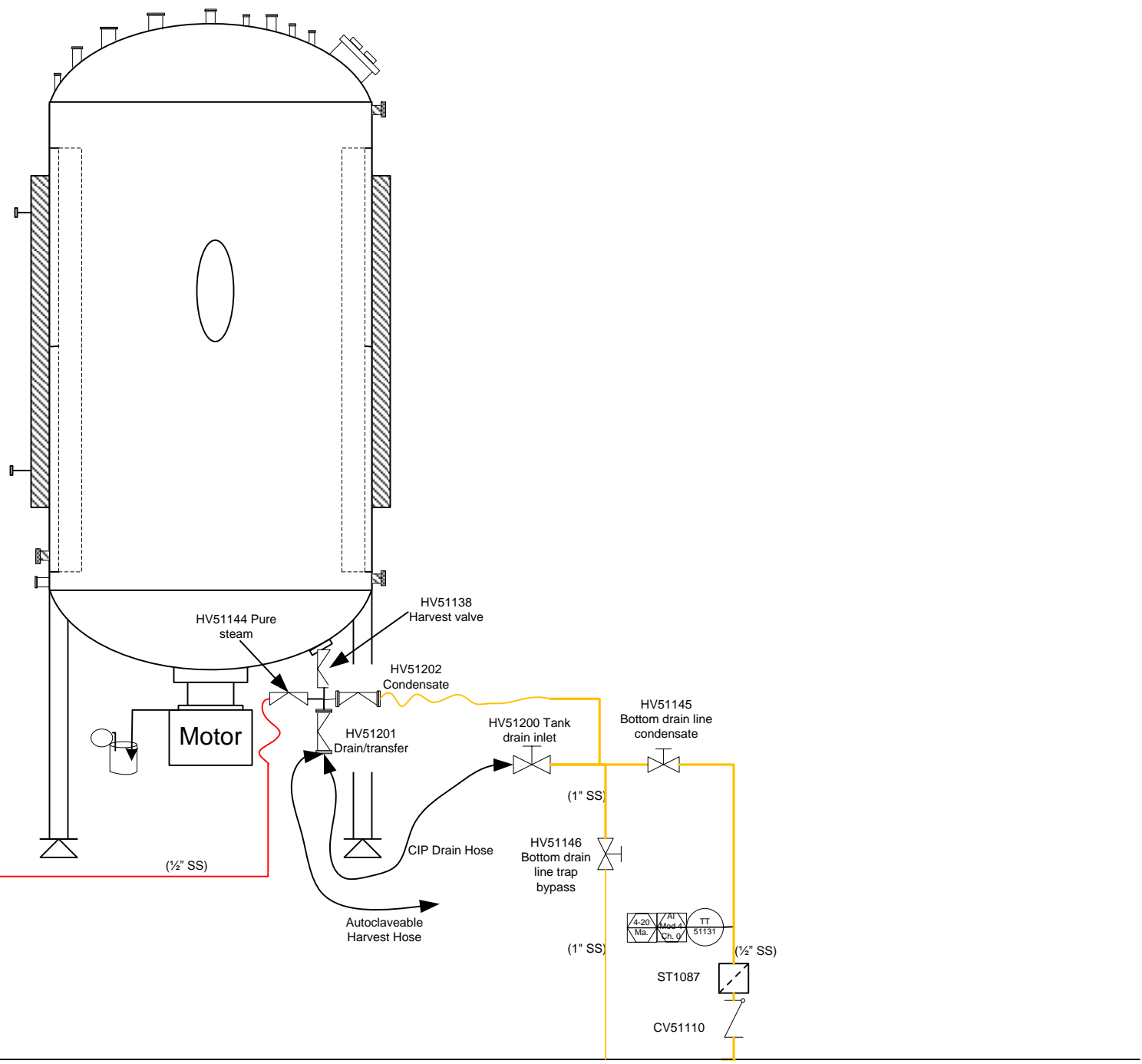
DECEMBER 21, 2012



To Condensate trap  
 ST2148  
 Page 1


Autoclaveable  
 masterflex fluid  
 delivery hose

Bio waste drain



Clean steam supply from PCV51028 to lower ports on fermenter. Page 1

Bio-waste drain

<b>NATIONAL CORN -TO-ETHANOL RESEARCH CENTER</b> <b>CONTROL SKID PROCESS FLOW DIAGRAM</b> <b>150 LITER FERMENTER #2</b>		
	TERRY LASH DECEMBER 21, 2012	Revisions Page 3 of 3

0 TT51131 Harvest valve hose connection line condensate 4-20 ma 0-150C	0 TT51143 Agitator seal Line condensate 4-20 ma 0-150C	0 AIT54130 Optical density transmitter 4 – 20 ma  Not Used	0 FIT51122 Fermenter pressure from love 4-20 ma 0-50 PSI Check love scaling!!	0 PCV51033 PLC output to fermenter back pressure control valve 4-20 ma 0-100% Open	0 ES51000 E-STOP Switch 120 VAC	0 YL51002 Acid Pump Run Confirm 15 VDC	0 XV51035 Fermenter Exhaust isolation valve 24VAC	0 SPARE	0 PU51001 Circulation Pump Switched 24 VAC	0 SPARE
1 TT51129 Tank sparge line condensate 4-20 ma 0-150C	1 SPARE	1 FIT51040 Air flow rate from Sierra transmitter 4-20 ma 0-1415 L/minute	1 TT51114 Fermenter Temperature 4-20ma 0-150C Check love scaling??	1 PCV51040 PLC output to fermenter air sparge/overlay control valve 4-20 ma 0-1000L/min range	1 YL51001 Circulation Pump Run Confirm 120VAC	1 YL51003 Base Pump Run Confirm 24 VDC	1 TCV51022 Fermenter cooling water valve 24VAC	1 SPARE	1 AG51125 Fermenter agitator start/stop Switched 24 VDC	1 SPARE
2 TT51133 Tank sample valve line condensate 4-20 ma 0-150C	2 SPARE	2 SPARE	2 FIT54039 Air/O2 flow rate from brooks transmitter CH2 0-5 VDC ?? 0-25 SPLM	2 SPARE	2 YL51125 Agitator Run Confirm 120VAC	2 YL51004 Anti-Foam Run Confirm 24 VDC	2 TCV51026 Fermenter heating steam valve 24VAC	2 FV51041 Enable for brooks air flow controller ch 1 Switched 15 VDC	2 SPARE	2 FC51041 DCS setpoint output to Brooks air sparge/overlay gas controller CH1 0 - 5 VDC 0-30 SPLM
3 TT51140 Anti-foam line condensate 4-20 ma 0-150C	3 SPARE	3 WIT51128 Fermenter load cell from Metter Toledo 4-20 ma 0 - 200 KG	3 FIT54041 Air flow rate from brooks transmitter CH1 0-5 VDC 0-30 SPLM	3 SC51002 PLC output to Masterflex pump for acid 4-20 ma	3 LSH51137 Hi Hi level probe 120 AC	3 YL51005 Enzyme Pump Run Confirm 24 VDC	3 TCV51024 Steam injection valve for sterilizing water jacket 24VAC	3 PU51002 Enable for Masterflex acid pump Switched 15 VDC	3 SPARE	3 FC51039 DCS setpoint output to Brooks O2/air sparge/overlay gas controller CH2 0 - 5 VDC 0-25 SPLM
4 TT51138 Acid line condensate 4-20 ma 0-150C	4 SPARE	4 IT51125 Fermenter agitator power from VFD 4-20 ma 0 – 200 %	4 FIT51003 Base pump speed 0 – 20 ma. 0 – 21 ml/min.	4 SPARE	4 SPARE	4 ZS51101 Rupture Disc Integrity 24VDC	4 XV51111 Fermenter top acid steamlock Isolation valve 24VAC	4 PU51003 Enable for Masterflex base pump Switched 15 VDC	4 SPARE	4 RSP51003 Remote set point to 4 – 20 ma output = 4 – 8 PH
5 TT51139 Base line condensate 4-20 ma 0-150C	5 SPARE	5 SIT51125 Fermenter agitator RPM from display 4 – 20 ma. 0 – 400 RPM	5 SPARE	5 SC51004 PLC output to Masterflex pump for anti- foam 4-20 ma	5 SPARE	5 LSH51136 Hi-level Foam Probe 24VDC	5 XV51126 Fermenter top anti- foam steamlock isolation valve 24VAC	5 PU51004 Enable for Masterflex anti-foam pump Switched 15 VDC	5 SPARE	5 SPARE
6 TT51141 Enzyme line condensate 4-20 ma 0-150C	6 SPARE	6 AIT51124 Fermenter DO transmitter 4-20 ma 0 – 200 % Free air From ch. 2 of Metter Toledo transmitter	6 SPARE	6 SC51005 PLC output to Masterflex pump for enzyme 4-20 ma	6 SPARE	6 SPARE	6 XV51126 Fermenter top base steamlock isolation valve 24VAC	6 PU51005 Enable for Masterflex enzyme pump Switched 15 VDC	6 SPARE	6 SPARE
7 TT51041 Post filter exhaust line condensate 4-20 ma 0-150C	7 SPARE	7 AIT51110 Fermenter PH transmitter 4-20 ma 2 – 10 PH DCS Love 0 - 20 ma 0-10 PH	7 SPARE	7 SC51125 PLC output to agitator VFD for speed control 4-20 ma 0 – 300 RPM	7 SPARE	7 SPARE	7 SPARE	7 FV51039 Enable for brooks O2/air flow controller ch. 2 Switched 15 VDC	7 SPARE	7 SPARE

AI Module 4  
Loop Powered

AI Module 5  
Loop Powered

AI Module 6  
Field Powered

AI Module 7  
Field powered

AO Module 8

DI Module 9  
8-15 SPARE

DI Module 10  
8-15 SPARE

DO Module 11  
Solenoid  
Valves

DO Module 12  
Low Voltage

DO Module 13

AO Module 14

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CONTROL SKID COMPUTER INTERFACE  
150 LITER FERMENTER

Revisions Page 3 of 3

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DECEMBER 21, 2012