| | ENGINEERED SYSTEMS (ESG)<br>ENGINEERING STANDARD<br><br>VSD Cooling System Drain and Fill Procedure<br><br>YMC$^2$ | STANDARD NO. | T-193 |
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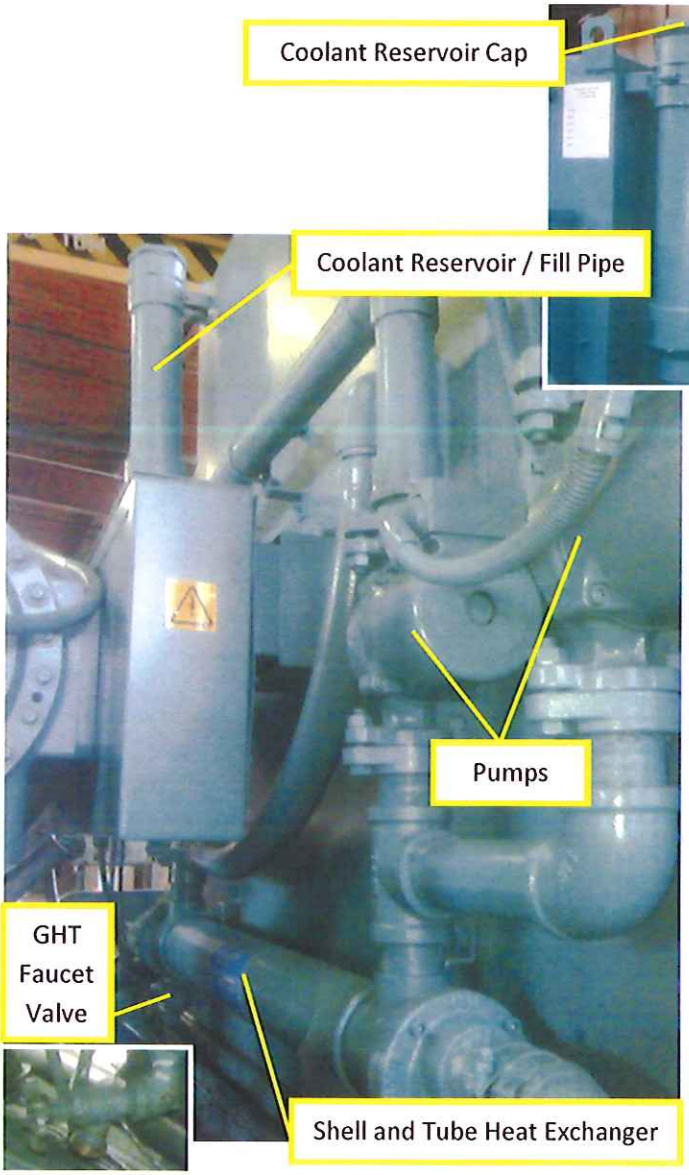
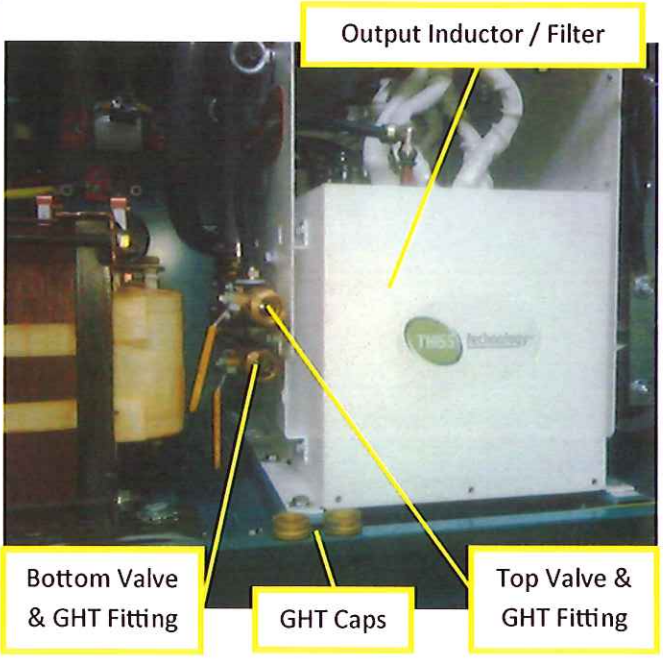
| Johnson Controls | | PAGE | 1 of 16 |
| | | DATE | 4/3/2012 |
| | | SUPERSEDES | 7/14/2011 |
| | | ECN | 0811-2572 |
| | | PREPARED BY | D. Wolf |
| | | APPROVED BY | M. Todd |
| | | APPROVED BY | J. Schreiber |
| | | APPROVED BY | M. Nielsen |

**HYP744 Cooling System Components:**




*Back of VSD*




*Inside of VSD Cabinet*

| Johnson Controls | ENGINEERED SYSTEMS (ESG)<br>ENGINEERING STANDARD<br><br>VSD Cooling System Drain and Fill Procedure<br><br>YMC$^2$ | STANDARD NO. | T-193 |
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| | | PREPARED BY | D. Wolf |
| | | APPROVED BY | M. Todd |
| | | APPROVED BY | J. Schreiber |
| | | APPROVED BY | M. Nielsen |

**HYP744 PROCEDURE ONLY**

**Draining the System (50 and 60 Hz):**

*NOTES*

*A. All fluids drained containing Glycol or Inhibited Water should be collected and disposed of according to facility procedures.*

*B. If two hoses are available the heat exchanger and the output filter can be drained at the same time.*

1. Remove coolant reservoir cap.
2. Attach hose to valve on the bottom of the shell and tube heat exchanger.
3. Ensure supply manifold valve(s) are open.
4. Open heat exchanger valve to allow coolant to drain. Once coolant stops flowing close the valve.
5. Attach hose to the top fitting of the output inductor inside the VSD cabinet.
6. Open top valve of the output inductor to allow coolant to drain.
7. Attach hose to the bottom fitting of the output inductor.
8. Open bottom valve of the output inductor to allow coolant to drain.
9. Loosely install coolant reservoir cap to prevent splashing but continue to vent air.
10. With both valves open use compressed air in the top fitting to blow residual liquid out of the output inductor.
    - ! Warning – Do NOT completely seal the compressed air line around the top fitting.
11. Attach hose to the valve on the bottom of the shell and tube heat exchanger.
12. Open heat exchanger valve to allow remaining coolant that was blown down to drain.
13. Close all valves and replace all caps. System is now drained.

**Flushing the System (50 and 60 Hz):**

*NOTES*

*A. All fluids drained containing Glycol or Inhibited Water should be collected and disposed of according to facility procedures.*

*B. Inhibited water used for flushing the system can be collected and re-used several times before disposal.*

1. Open the supply manifold valve(s).
2. Remove cap from the coolant reservoir.
3. Fill unit to within 1 to 2 inches below the threaded portion of the coolant reservoir with inhibited water.
4. Power up the unit.

5. Start pumps using the Optiview.
    5.1. Press: Home > VSD > VSD Details > Manual Cooling > Enable.
6. Allow pumps to run for 30 seconds.
7. Disable the pumps.
    7.1. Press: Home > VSD > VSD Details > Manual Cooling > Disable.
8. Check the fill pipe and add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
9. Close the supply manifold valve(s).
10. Start the pumps and run for 30 seconds.
11. Disable the pumps and check the fill pipe. Add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
12. Open the supply manifold valve(s).
13. Start pumps and run for 30 seconds.
14. Disable the pumps.
15. Attach hose to valve on the bottom of the shell and tube heat exchanger.
16. Open heat exchanger valve to allow coolant to drain. Once coolant stops flowing close the valve.
17. Re-fill unit to within 1 to 2 inches below the threaded portion of the coolant reservoir with inhibited water.
18. Start the pumps and run for 30 seconds.
19. Disable the pumps and check the fill pipe. Add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
20. Start the pumps and run for 30 seconds.
21. Drain the inhibited water from the system following the "Draining the System" procedure.

**To convert from Glycol (yellow) to Inhibited Water (pink) (50 and 60 Hz):**

*NOTES*

*A. For a factory test the Glycol can be collected and reinstalled in the VSD for outgoing shipment upon completion of the test.*

1. Drain Glycol from the system following the "Draining the System" procedure.
2. Flush the system with inhibited water following the "Flushing the System" procedure.
3. Close heat exchanger drain valve and output inductor drain valves. These valves will remain closed for this procedure.
4. Open supply manifold valve(s).

5. Remove cap from the coolant reservoir.
6. Fill unit to within 1 to 2 inches below the threaded portion of the coolant reservoir with inhibited water.
7. Power up the unit.
8. Start pumps using the Optiview.
   8.1. Press: Home > VSD > VSD Details > Manual Cooling > Enable.
9. Allow pumps to run for 15 seconds.
10. Disable the pumps.
    10.1. Press: Home > VSD > VSD Details > Manual Cooling > Disable.
11. Check the fill pipe and add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
12. Start the pumps and run for 5 minutes.
13. Disable the pumps and check the fill pipe. Add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
14. Close the supply manifold valve(s).
15. Start the pumps and run for 5 minutes.
16. Disable the pumps and check the fill pipe. Add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
17. Open the supply manifold valve(s).
18. Start the pumps and run for 10 minutes.
19. Disable the pumps and check the fill pipe. Add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
20. Close the supply manifold valve(s).
21. Start the pumps and run for 10 minutes.
22. Disable the pumps and check the fill pipe. Add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
23. Open the supply manifold valve(s).
24. Start the pumps and run for 15 minutes.
25. Disable the pumps and check the fill pipe. Add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
26. Close the supply manifold valve(s).
27. Start the pumps and run for 15 minutes.

28. Disable the pumps and check the fill pipe. Add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
29. Open the supply manifold valve(s).
30. Start the pumps and run for 20 minutes.
31. Disable the pumps.
32. Check the fill pipe for inhibited water level. Add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
33. Check the fill pipe again for inhibited water level at 1 hour and 24 hours of operation.

! Warning - Coolants may foam up when cycled through the system and when the pumps are shut off the coolants tend to rise. Do not fill reservoir to top wile unit is running or it may overflow when pumps are shut off.

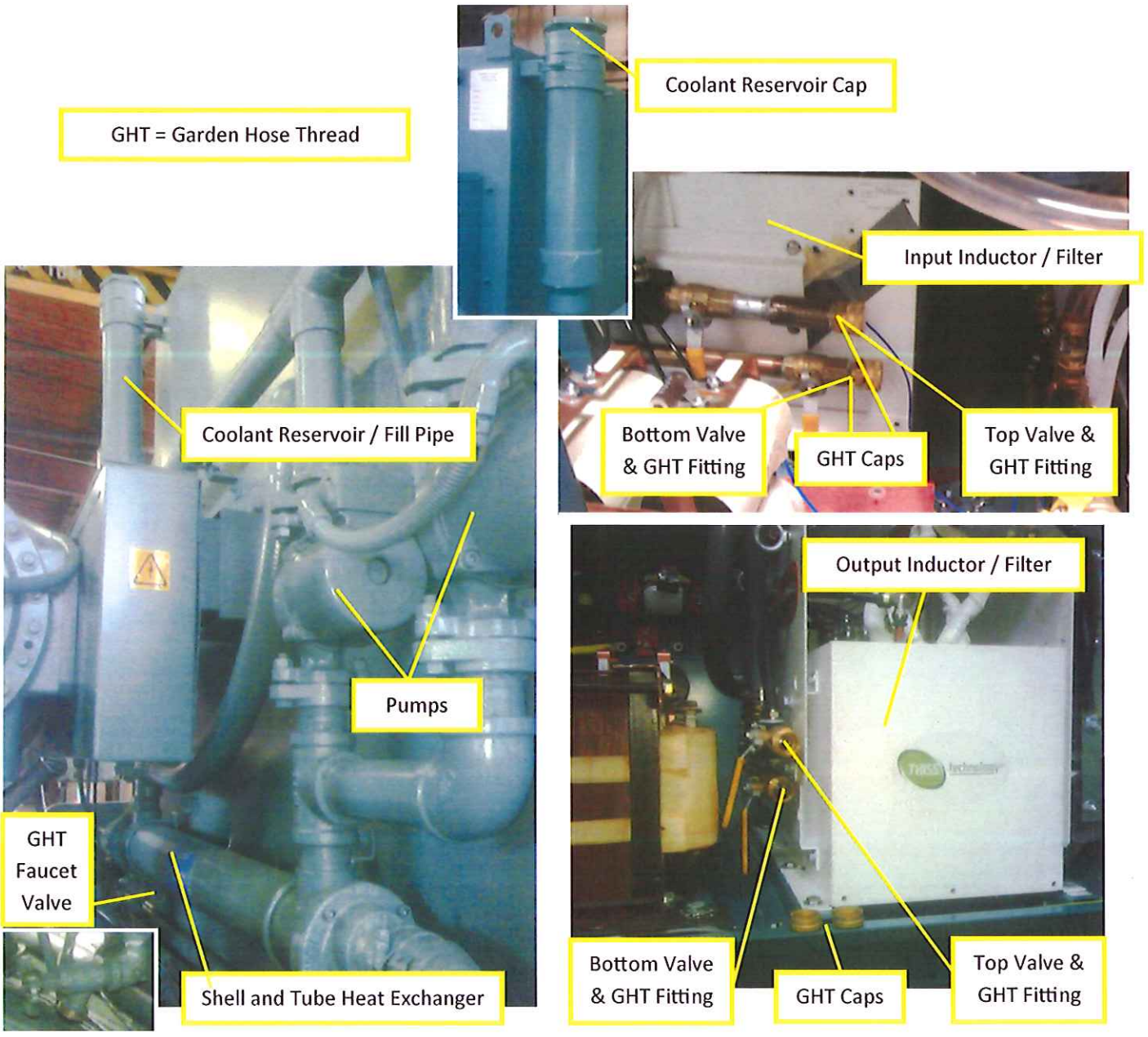
! Visually verify through clear inductor hoses that color change in working fluid has occurred in order to verify coolant flow through the inductor.

**To convert from Inhibited Water (pink) to Glycol (yellow) (50 and 60 Hz):**

1. Drain inhibited water from the system following the "Draining the System" procedure.
2. Remove cap from the coolant reservoir.
3. Open supply manifold valve(s).
4. Fill unit to within 1 to 2 inches below the threaded portion of the coolant reservoir with Glycol.
5. Power up the unit.
6. Start pumps using Optiview.
   6.1. Press: Home > VSD > VSD Details > Manual Cooling > Enable.
7. Allow pumps to run for 60-90 seconds.
8. Disable the pumps.
   8.1. Press: Home > VSD > VSD Details > Manual Cooling > Disable.
9. Check the fill pipe and add more Glycol to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
10. Close the supply manifold valve(s).
11. Start the pumps and run for 60-90 seconds.
12. Disable the pumps and check the fill pipe. Add more Glycol to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
13. Open the supply manifold valve(s).

14. Start the pumps and run for 5 minutes.
15. Disable the pumps and check the fill pipe. Add more Glycol to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
16. Close the supply manifold valve(s).
17. Start the pumps and run for 5 minutes.
18. Disable the pumps and check the fill pipe. Add more Glycol to bring the level back t0 within 1 to 2 inches below the threaded portion of the coolant reservoir.
19. Open the supply manifold valve(s).
20. Start the pumps and run for 10 minutes.
21. Disable the pumps and check the fill pipe. Add more Glycol to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
22. Close the supply manifold valve(s).
23. Start the pumps and run for 10 minutes.
24. Disable the pumps and check the fill pipe. Add more Glycol to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
25. Open the supply manifold valve(s).
26. Start the pumps and run for 15 minutes.
27. Disable the pumps and check the fill pipe. Add more Glycol to bring the level to within 1 to 2 inches below the threaded portion of the coolant reservoir.

**HYP774 Cooling System Components:**




*Back of VSD*

*Inside of VSD Cabinet*

**HYP774 PROCEDURE ONLY**

**Draining the System (50 and 60 Hz):**

*NOTES*

*A. All fluids drained containing Glycol or Inhibited Water should be collected and disposed of according to facility procedures.*

*B. If two hoses are available the heat exchanger and the output filter can be drained at the same time.*

1. Remove coolant reservoir cap.
2. Attach hose to valve on the bottom of the shell and tube heat exchanger.
3. Open heat exchanger valve to allow coolant to drain. Once coolant stops flowing close the valve.
4. Attach hose to the top fitting of the output inductor inside the VSD cabinet.
5. Open top valve of the output inductor to allow coolant to drain.
6. Attach hose to the bottom fitting of the output inductor.
7. Open bottom valve of the input inductor to allow coolant to drain.
8. Loosely install coolant reservoir cap to prevent splashing but continue to vent air.
9. With both valves open use compressed air in the top fitting to blow residual liquid out of the output inductor.
   - ! Warning – Do NOT completely seal the compressed air line around the top fitting.
10. Close the output inductor drain valves.
11. Attach hose to the top fitting of the input inductor inside the VSD cabinet.
12. Open top valve of the input inductor to allow coolant to drain.
13. Attach hose to the bottom fitting of the input inductor.
14. Open bottom valve of the input inductor to allow coolant to drain.
15. Loosely install coolant reservoir cap to prevent splashing but continue to vent air.
16. With both valves open use compressed air in the top fitting to blow residual liquid out of the input inductor.
    - ! Warning – Do NOT completely seal the compressed air line around the top fitting.
17. Close the input inductor drain valves.
18. Attach hose to the valve on the bottom of the shell and tube heat exchanger.
19. Open heat exchanger valve to allow remaining coolant that was blown down to drain.
20. Close all valves and replace all caps. System is now drained.

**Flushing the System (50 and 60 Hz):**

*NOTES*

A. *All fluids drained containing Glycol or Inhibited Water should be collected and disposed of according to facility procedures.*
B. *Inhibited water used for flushing the system can be collected and re-used several times before disposal.*

1. Remove cap from the coolant reservoir.
2. Fill unit to within 1 to 2 inches below the threaded portion of the coolant reservoir with inhibited water.
3. Power up the unit.
4. Start pumps using the Optiview.
    4.1. Press: Home > VSD > VSD Details > Manual Cooling > Enable.
5. Allow pumps to run for 30 seconds.
6. Disable the pumps.
    6.1. Press: Home > VSD > VSD Details > Manual Cooling > Disable.
7. Check the fill pipe and add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
8. Start the pumps and run for 30 seconds.
9. Disable the pumps and check the fill pipe. Add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
10. Start pumps and run for 30 seconds.
11. Disable the pumps.
12. Attach hose the bottom of the shell and tube heat exchanger.
13. Allow coolant to drain from the heat exchanger.
14. Re-fill unit to within 1 to 2 inches below the threaded portion of the coolant reservoir with inhibited water.
15. Start the pumps and run for 30 seconds.
16. Disable the pumps and check the fill pipe. Add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
17. Start the pumps and run for 30 seconds.
18. Drain the inhibited water from the system following the "Draining the System" procedure.

**To convert from Glycol (yellow) to Inhibited Water (pink) (50 and 60 Hz):**

*NOTES*

*A. For a factory test the Glycol can be collected and reinstalled in the VSD for outgoing shipment upon completion of the test.*

1. Drain Glycol from the system following the "Draining the System" procedure.
2. Flush the system with inhibited water following the "Flushing the System" procedure.
3. Close heat exchanger drain valve, input drain valves, and output inductor drain valves. These valves will remain closed for this procedure.
4. Remove cap from the coolant reservoir.
5. Fill unit to within 1 to 2 inches below the threaded portion of the coolant reservoir with inhibited water.
6. Power up the unit.
7. Start pumps using the Optiview.

   7.1. Press: Home > VSD > VSD Details > Manual Cooling > Enable.
8. Allow pumps to run for 15 seconds.
9. Disable the pumps.

   9.1. Press: Home > VSD > VSD Details > Manual Cooling > Disable.
10. Check the fill pipe and add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
11. Repeat steps 7-10 until the level of inhibited water remains constant.
12. Start the pumps and run for 1 hour. Check the coolant level every 15 minutes and add inhibited water as needed to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
13. The coolant level should be check daily for 3 days after fill.
14. After 3 days, the coolant level should be checked weekly for 4 weeks.
15. After 4 weeks, the coolant level should be checked once every 2 months.

- ! Warning - Coolants may foam up when cycled through the system and when the pumps are shut off the coolants tend to rise. Do not fill reservoir to top wile unit is running or it may overflow when pumps are shut off.
- ! Visually verify through clear inductor hoses that color change in working fluid has occurred in order to verify coolant flow through the inductor.

**To convert from Inhibited Water (pink) to Glycol (yellow) (50 and 60 Hz):**

1. Drain inhibited water from the system following the "Draining the System" procedure.
2. Remove cap from the coolant reservoir.
3. Fill unit to within 1 to 2 inches below the threaded portion of the coolant reservoir with Glycol.
4. Power up the unit.
5. Start pumps using the Optiview.
   5.1. Press: Home > VSD > VSD Details > Manual Cooling > Enable.
6. Allow pumps to run for 15 seconds.
7. Disable the pumps.
   7.1. Press: Home > VSD > VSD Details > Manual Cooling > Disable.
8. Check the fill pipe and add more glycol to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
9. Repeat steps 5-8 until the level of glycol remains constant.
10. Start the pumps and run for 1 hour. Check the coolant level every 15 minutes and add glycol as needed to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
11. Disable the pumps and check the fill pipe. Add more Glycol to bring the level to approximately 1 to 2 inches below the bottom of the threads of the coolant reservoir cap.

| | ENGINEERED SYSTEMS (ESG)<br>ENGINEERING STANDARD<br><br>VSD Cooling System Drain and Fill Procedure<br><br>YMC$^2$ | STANDARD NO. | T-193 |
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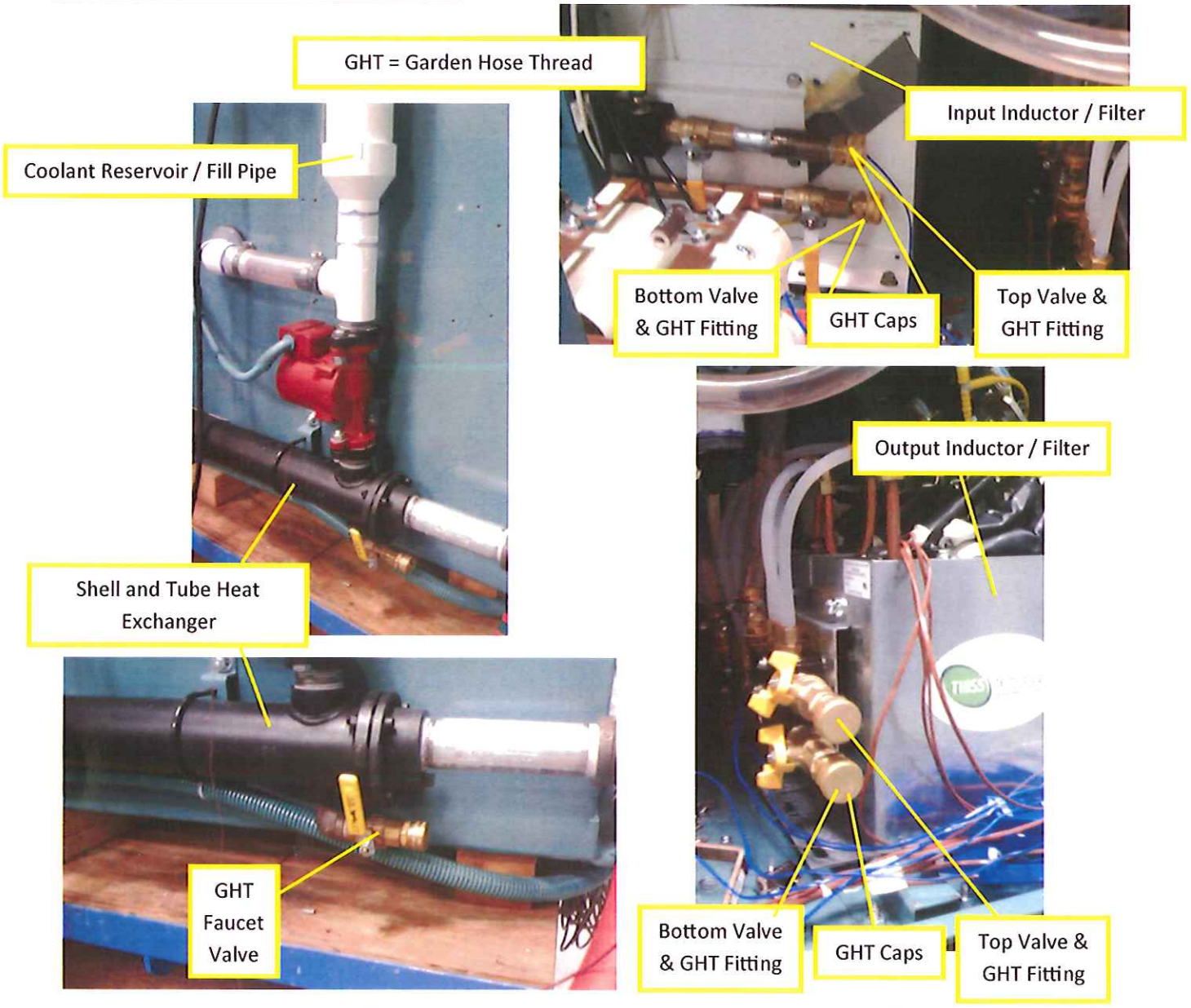
| | | DATE | 4/3/2012 |
| | | SUPERSEDES | 7/14/2011 |
| | | ECN | 0811-2572 |
| | | PREPARED BY | D. Wolf |
| | | APPROVED BY | M. Todd |
| | | APPROVED BY | J. Schreiber |
| | | APPROVED BY | M. Nielsen |

**HYP490 Cooling System Components:**




*Back of VSD*

*Inside of VSD Cabinet*

**HYP490 PROCEDURE ONLY**

**Draining the System (50 and 60 Hz):**

*NOTES*

*A. All fluids drained containing Glycol or Inhibited Water should be collected and disposed of according to facility procedures.*

*B. If two hoses are available the heat exchanger and the output filter can be drained at the same time.*

1. Remove coolant reservoir cap.
2. Attach hose to valve on the bottom of the shell and tube heat exchanger.
3. Open heat exchanger valve to allow coolant to drain. Once coolant stops flowing close the valve.
4. Attach hose to the top fitting of the output inductor inside the VSD cabinet.
5. Open top valve of the output inductor to allow coolant to drain.
6. Attach hose to the bottom fitting of the output inductor.
7. Open bottom valve of the input inductor to allow coolant to drain.
8. Loosely install coolant reservoir cap to prevent splashing but continue to vent air.
9. With both valves open use compressed air in the top fitting to blow residual liquid out of the output inductor.
   ! Warning – Do NOT completely seal the compressed air line around the top fitting.
10. Close the output inductor drain valves.
11. Attach hose to the top fitting of the input inductor inside the VSD cabinet.
12. Open top valve of the input inductor to allow coolant to drain.
13. Attach hose to the bottom fitting of the input inductor.
14. Open bottom valve of the input inductor to allow coolant to drain.
15. Loosely install coolant reservoir cap to prevent splashing but continue to vent air.
16. With both valves open use compressed air in the top fitting to blow residual liquid out of the input inductor.
    ! Warning – Do NOT completely seal the compressed air line around the top fitting.
17. Close the input inductor drain valves.
18. Attach hose to the valve on the bottom of the shell and tube heat exchanger.
19. Open heat exchanger valve to allow remaining coolant that was blown down to drain.
20. Close all valves and replace all caps. System is now drained.

**Flushing the System (50 and 60 Hz):**

*NOTES*

*A. All fluids drained containing Glycol or Inhibited Water should be collected and disposed of according to facility procedures.*

*B. Inhibited water used for flushing the system can be collected and re-used several times before disposal.*

1. Remove cap from the coolant reservoir.
2. Fill unit to within 1 to 2 inches below the threaded portion of the coolant reservoir with inhibited water.
3. Power up the unit.
4. Start pumps using the Optiview.
    4.1. Press: Home > VSD > VSD Details > Manual Cooling > Enable.
5. Allow pumps to run for 30 seconds.
6. Disable the pumps.
    6.1. Press: Home > VSD > VSD Details > Manual Cooling > Disable.
7. Check the fill pipe and add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
8. Start the pumps and run for 30 seconds.
9. Disable the pumps and check the fill pipe. Add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
10. Start pumps and run for 30 seconds.
11. Disable the pumps.
12. Attach hose the bottom of the shell and tube heat exchanger.
13. Allow coolant to drain from the heat exchanger.
14. Re-fill unit to within 1 to 2 inches below the threaded portion of the coolant reservoir with inhibited water.
15. Start the pumps and run for 30 seconds.
16. Disable the pumps and check the fill pipe. Add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
17. Start the pumps and run for 30 seconds.
18. Drain the inhibited water from the system following the "Draining the System" procedure.

**To convert from Glycol (yellow) to Inhibited Water (pink) (50 and 60 Hz):**

*NOTES*

*A. For a factory test the Glycol can be collected and reinstalled in the VSD for outgoing shipment upon completion of the test.*

1. Drain Glycol from the system following the "Draining the System" procedure.
2. Flush the system with inhibited water following the "Flushing the System" procedure.
3. Close heat exchanger drain valve, input drain valves, and output inductor drain valves. These valves will remain closed for this procedure.
4. Remove cap from the coolant reservoir.
5. Fill unit to within 1 to 2 inches below the threaded portion of the coolant reservoir with inhibited water.
6. Power up the unit.
7. Start pumps using the Optiview.

   7.1. Press: Home > VSD > VSD Details > Manual Cooling > Enable.
8. Allow pumps to run for 15 seconds.
9. Disable the pumps.

   9.1. Press: Home > VSD > VSD Details > Manual Cooling > Disable.
10. Check the fill pipe and add more inhibited water to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
11. Repeat steps 7-10 until the level of inhibited water remains constant.
12. Start the pumps and run for 1 hour. Check the coolant level every 15 minutes and add inhibited water as needed to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
13. The coolant level should be check daily for 3 days after fill.
14. After 3 days, the coolant level should be checked weekly for 4 weeks.
15. After 4 weeks, the coolant level should be checked once every 2 months.

- ! Warning - Coolants may foam up when cycled through the system and when the pumps are shut off the coolants tend to rise. Do not fill reservoir to top wile unit is running or it may overflow when pumps are shut off.
- ! Visually verify through clear inductor hoses that color change in working fluid has occurred in order to verify coolant flow through the inductor.

**To convert from Inhibited Water (pink) to Glycol (yellow) (50 and 60 Hz):**

1. Drain inhibited water from the system following the "Draining the System" procedure.
2. Remove cap from the coolant reservoir.
3. Fill unit to within 1 to 2 inches below the threaded portion of the coolant reservoir with Glycol.
4. Power up the unit.
5. Start pumps using the Optiview.
   5.1. Press: Home > VSD > VSD Details > Manual Cooling > Enable.
6. Allow pumps to run for 15 seconds.
7. Disable the pumps.
   7.1. Press: Home > VSD > VSD Details > Manual Cooling > Disable.
8. Check the fill pipe and add more glycol to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
9. Repeat steps 5-8 until the level of glycol remains constant.
10. Start the pumps and run for 1 hour. Check the coolant level every 15 minutes and add glycol as needed to bring the level back to within 1 to 2 inches below the threaded portion of the coolant reservoir.
11. Disable the pumps and check the fill pipe. Add more Glycol to bring the level to approximately 1 to 2 inches below the bottom of the threads of the coolant reservoir cap

**Part Numbers:**

Inhibited Water (Pink)
- 1 gal = 013-02987-000
- 55 gal = 013-03346-000

Glycol (Yellow)
- 5 gal = 013-03344-000
- 55 gal = 013-03345-000

| Unit | Capacity (gallons) |
|---|---|
| HYP744 | ~ 6 |
| HYP774 | ~ 7 |
| HYP490 | ~ 4 |