HydraSTX Gen 2 Testing

9/22/2022

- Intentionally de-clocked Aux A servo // Did not fault when latching – did fault when operating Aux A manually
- Intentionally de-clocked Unload function // correctly faulted – error code 2:1
- Run calibration – calibration successful
- Tried turning system on – would flash for a split second and shut off (attempted 3 or 4 times)
- Turned system on – system turned on for approximately 30 seconds and then shut off again – error code 1:1
- Turn system on – came on for 10 seconds and shut down
- Unplug all servos & turn system on – System comes on and stays on
- Plug grip/release servo in - system stays on
- Plug load/unload servo in – system stayed on for 15 seconds and shut down – error code 1:1
- Plug Aux servo in AND unplugged load/unload servo – system stayed on for 15 seconds and shut down – error code 1:1
- REPLACED load/unload and Aux servo
- Intentionally de-clock load/unload servo toward unload – hold in unload direction and system shut down – error code 2:1
- Run calibration – calibration successful
- Hold in unload direction – system shut down – error code 2:1
- Turn system on – no functions commanded – system shut down @ 15 seconds
- Plug OLD in-cab controller in – function test OKAY
- Plug new controller in – turn system on – shut down at 10 seconds – error code 1:1

Meeting hypothesis – Truck voltage with alternator operating at 14.1V – The added voltage is pushing the current higher and causing faults

Testing hypothesis

- Turn system on with truck engine OFF – system stays on
- Turn truck engine ON – system shut down at 10 seconds
- Turn system on with truck engine OFF – system stays on
- Intentionally de-clock L/U servo towards load
- Turn system on – valve not centered – no commands – engine off – system shut down @ 10 seconds – error code 1:1
- Run calibration – calibration successful
- Turn system on – corrected valve center – system stays on
- Seemed to be over-stroking on load still (could not shift valve any further) – did NOT turn system off
    - Unpinned and checked the true load stroke – end of servo stroke was perfectly lined up with end of valve stroke – no extra room but was not over-stroking
- Shift load servo and physically impede full valve shift – system shut down – error code 2:1

Meeting Notes

Current monitoring Issue – We are measuring total current on “SYSTEM” and building an allowable total current threshold for servos. “SYSTEM” also provides power to feeder branch.

Solution: Set one current threshold for when servos are being commanded off center – set a different current threshold for when servos are being commanded to center. This means accepting that feeder functions and HydraBed functions cannot be simultaneously operated.

10-20-2022

- Intentionally de-clock aux servo towards aux a – shift aux a with RF remote – error code 2:3
- Shift aux a with RF remote – error code 2:3
- Run calibration – calibration successful
- Shift Aux A with rf remote – no error – no issues
- Latch Aux A with in-cab – Shut down at 2-1/2 minutes – error code 2:3
- Run calibration – successful calibration
- Latch Aux A with In-cab – Shut down at 3 min 10 sec – error code 2:3
- Shift load/unload toward unload and hold (RF remote) – Shut down at 2 minutes – error code 2:2
- Shift grip/release toward grip and hold (in-cab controller) – No issues – held for 4 minutes
- Shift L/U servo toward unload (In-cab controller) – Shut down at 1 min 20 sec – error code 2:2
- Shift L/U servo toward load (In-cab controller) – shut down at 20 sec
- Shift L/U servo toward load (In-cab controller) – shut down at 15 sec – error code 2:2
- Run calibration – calibration successful
- Shift L/U servo toward load (In-cab controller) – shut down at 1 min 45 sec – error code 2:2
- Intentionally de-clock G/R servo toward grip
- Hold grip (in-cab controller) – no fault for 2 min – physically pull grip – system shut down – error code 2:1
- Function test – unload not fully shifting – release not shifting far enough for any hydraulic flow (arms not releasing at all)
- Run calibration – calibration successful
- Not fully shifting LOAD, UNLOAD, GRIP, or RELEASE
    - Would marginally shift load and grip – very little hydraulic flow
    - Not shifting release or unload enough for any hydraulic flow
- Reconnect original in-cab controller – fix AUX & G/R servo clocking
- Reconnect G2 prototype in-cab controller
- Shift Aux B (RF remote) – Shut down at 10 sec
- Run calibration – calibration successful
- Shift Aux B (RF remote) – Shut down at 7 sec
- Function Test
    - Not shifting ANY valve far enough to operate HydraBed arms

11/11/2022

- In-Cab
  - Function Test – Not OK
  - Run LOAD/UNLOAD for approximately 10 sec – FAULT Error Code 1:1
  - Run calibration – calibration successful
  - Function Test – Not OK
  - Run LOAD/UNLOAD for approximately 10 sec – FAULT Error Code 1:1
  - Faults occur from back & forth functions (Load 1 sec, Unload 1 sec, repeat)
  - Hold LOAD for 2 min – No fault
  - GRIP, RELEASE, GRIP, RELEASE – FAULT Error Code 2:1
  - Hold GRIP function for 2 min – No Fault
  - AUX A function for 5 min – No Fault
- RF REMOTE
  - Intentionally De-Clock AUX servo toward AUX B
  - Run Calibration – calibration successful
  - AUX A – Under-stroking // AUX B – Over-stroking // Center – Offset toward AUX B
  - Run AUX B for 22 sec – FAULT Error Code 2:3
  - Run calibration – calibration successful
    Run AUX B for 9 sec – FAULT
  - RUN GRIP for 12 sec – FAULT Error Code 2:1
  - RELEASE for 15 sec – System flashed for 1 or 2 sec and then faulted
  - UNLOAD for 13 sec – System flashed for 1-2 sec and then faulted – Error Code 2:2
- In-cab
  - UNLOAD for 10 sec – Fault (System Flashed)
  - Run calibration – calibration successful
  - UNLOAD for 1 min 2 sec – FAULT – Error code 2:2

12-8-2022

- Function Test – OK

Clocking Pre-calibration		Clocking Post-calibration	
GRIP	Over-stroking	GRIP	*Slight Over-stroke?*
RELEASE	OK	RELEASE	OK
LOAD	OK	LOAD	OK
UNLOAD	Over-stroking	UNLOAD	*Slight Over-stroke?*
AUX A	Over-stroking	AUX A	OK
AUX B	OK	AUX B	*Slight Over-stroke?*

- DUTY CYCLE TESTING

RF REMOTE		IN-CAB CONTROLLER	
GRIP	2 min – No fault	GRIP & LIGHTS	1 min 30 sec – No Fault
RELEASE	2 min – No fault	LOAD & LIGHTS	1 min 30 sec – No Fault
LOAD	2 min – No fault	UNLOAD & LIGHTS	10 sec - FAULT
UNLOAD	2 min – No fault	AUX A & LIGHTS	30 sec – No Fault
AUX A	2 min – No fault	AUX B & LIGHTS	30 sec – No Fault
AUX B	2 min – No fault		

- Suspecting UNLOAD issue with In-cab controller
  - UNLOAD 1 Min RF Remote – No Fault
  - Run Calibration – Calibration successful
  - In-cab controller UNLOAD for 8 sec – FAULT Error Code 2:2
  - Issue with UNLOAD using in-cab controller but <u>not RF Remote</u>

12-12-2022

Clocking Pre-calibration		Clocking Post-calibration	
GRIP	OK	GRIP	*Slight Over-stroke?*
RELEASE	OK	RELEASE	OK
LOAD	OK/*Under-stroking?*	LOAD	OK
UNLOAD	OK/*Under-stroking?*	UNLOAD	OK
AUX A	Over-stroking	AUX A	*Slight Over-stroke?*
AUX B	OK	AUX B	OK

- DUTY CYCLE TESTING

RF REMOTE		IN-CAB CONTROLLER	
GRIP		GRIP	2 min– No Fault
RELEASE		RELEASE	2 min– No Fault
LOAD		LOAD	2 min– No Fault
UNLOAD	2 min – No fault	UNLOAD	30 sec – No Fault
AUX A		AUX A	***See Notes Below*
AUX B		AUX B	2 min– No Fault

**Controller did not fault and did not shut off

**Servo centered valve somewhere between 3 min and 4 min 55 sec

**Controller showing that Latch still engaged & flashing

**Servo not responsive

**Move AUX connection to LOAD/UNLOAD servo – functions as usual

**Aux Servo failed

12-15-2022

- Clocking Check

Clocking Pre-calibration		Clocking Post-calibration	
GRIP	Over-stroking	GRIP	*OK*
RELEASE	Over-stroking	RELEASE	OK
LOAD	OK	LOAD	OK
UNLOAD	OK	UNLOAD	OK
AUX A	OK	AUX A	*OK*
AUX B	Over-stroking	AUX B	OK

- Duty Cycle Testing

IN-CAB CONTROLLER	
GRIP	8 sec – Fault 2:1
RELEASE	6 Sec – Fault 2:1
LOAD	6 Sec – Fault 2:2
UNLOAD	6 Sec – Fault 2:2
AUX A	7 Sec – Fault 2:3
AUX B	55 Sec – Fault 2:3

12-20-2022

- Clocking Check

Clocking Pre-calibration		Clocking Post-calibration	
GRIP	OK	GRIP	*OK*
RELEASE	OK	RELEASE	OK
LOAD	OK	LOAD	OK
UNLOAD	OK	UNLOAD	OK
AUX A	OK	AUX A	*OK*
AUX B	OK	AUX B	OK

- DUTY CYCLE TESTING

RF REMOTE		IN-CAB CONTROLLER	
GRIP	2 Min – No Fault	GRIP	2 min – No Fault
RELEASE	2 Min – No Fault	RELEASE	1 Min 55 Sec – Fault
LOAD	1 Min 40 Sec – Fault	LOAD	2 Min – No Fault
UNLOAD	1 Min 46 Sec – Fault	UNLOAD	2 Min – No Fault
AUX A	1 Min 45 Sec – Fault	AUX A	*"Latch"* 5 Min – No Fault
AUX B	2 Min – No Fault	AUX B	2 min – No Fault

- Intentionally de-clock LOAD/UNLOAD servo to over-stroke toward UNLOAD
- Unload for 8 Sec – Successful Fault - Error Code 2:2
- Run calibration-calibration successful
- Unload for 1 Min 59 Sec – Fault – Error Code 2:2

- Latch for 1 hour – No Fault *(Servo housing HOT)*

In-cab Controller (*With PUMP & WORK LIGHTS ON)*

- GRIP – Work Lights shut off @ 15 Sec – PUMP shut off @ 1 Min 30 Sec
- LOAD – Work Lights shut off @ 8 Sec – PUMP shut off @ 17 Sec
- Work Lights not turning on after 2nd fault, finally turned on & shut off after 10 Sec
- LOAD (No Work Lights) – PUMP shut off @ 10 Sec
- SYSTEM & Lights turned off just trying to run bed consistently – Error Code 1:2 or 3:0

12/22/2022

- Clocking Check

Clocking Pre-calibration		Clocking Post-calibration	
GRIP	OK	GRIP	*OK*
RELEASE	OK	RELEASE	OK
LOAD	OK	LOAD	OK
UNLOAD	OK	UNLOAD	OK
AUX A	OK	AUX A	*OK*
AUX B	OK	AUX B	OK

- DUTY CYCLE TESTING

RF REMOTE		IN-CAB CONTROLLER	
GRIP	2 Min – No Fault	GRIP	2 min – No Fault
RELEASE	2 Min – No Fault	RELEASE	2 Min – No Fault
LOAD	2 Min – No Fault	LOAD	2 Min – No Fault
UNLOAD	2 Min – No Fault	UNLOAD	2 Min – No Fault
AUX A	5 Min – No Fault	AUX A	*"Latch"* 5 Min – No Fault
AUX B	2 Min – No Fault	AUX B	2 min – No Fault

- Tested all functions with AND without Pump, Work Lights, E/H Pump, and all Feeder functions including loaded spout actuator.
- Only fault that occurred was when trying to operate a HydraBed function's servo AND running Spout actuator simultaneously.
    - This is expected due to the manner in which we are obtaining current measurements (*See page 2, 9/22/2022 Meeting Notes)* – We do not anticipate users needing to operate HydraBed function and spout actuator simultaneously