



HD Motorsports, LLC
2118 Downing Lane
Suite 120
Leander, TX 78641
(512) 886-3443
info@hdmstx.com
www.hdmstx.com

Invoice #3037

Created: 1/31/2023 10:57 AM CST
Completed: 9/26/2023 03:10 PM CDT
Invoiced: 9/27/2023 08:44 AM CDT
Payment Term: On Receipt
Service Writer: Todd "Therk" Therkildsen

Suspension

Shop Supplies (6%): \$44.16 Tax (6.25%): \$47.50 Total: \$1,597.72

Exhaust

In-cabin noise is too loud

Description	Price	QTY	Subtotal
1 Add Secondary Resonators to Exhaust	\$846.95		\$846.95
2 Tow from HD to Walker Pro 4/13	\$178.75		\$178.75
3 Tow from Walker Pro to HD 4/14	\$178.75		\$178.75
			Total: \$1,204.45

Find Source of the Rubbing

Description	HRS	Subtotal
1 Determine the Cause of the Rubbing - Issue was due to worn suspension components on the vehicle. New suspension components have eliminated the rubbing. <i>Note: Removed front wheels and found rubbing concern and took pictures, placed front on jack stands re installed wheels had steering wheel lock to lock and found rub points. Rubbing concern went away with new suspension components. Lowering springs were the cause of the issue primarily.</i>	1	\$160.00

Shop Supplies (6%): \$9.60 Total: \$169.60

Thunderbird Mirrors

Description	Price	QTY	HRS	Subtotal
1 R&R Door Mirrors <i>Note: Both Door mirror assemblies replaced and verified both are operational at this time</i>			1	\$160.00
2 Paint Mirror Caps to Match Body Color	\$431.08			\$431.08
3 Driver Door Mirror Assembly	\$228.52	1		\$228.52
4 Passenger Door Mirror Assembly	\$237.85	1		\$237.85
5 Driver Mirror Caps	\$52.82	1		\$52.82
6 Passenger Mirror Caps	\$53.08	1		\$53.08

Shop Supplies (6%): \$9.60 Tax (6.25%): \$35.77 Total: \$1,208.72

Alignment

Description	HRS	Subtotal
1 Four-Wheel Alignment Factory Specs.	1.5	\$240.00

Shop Supplies (6%): \$14.40 Total: \$254.40



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Invoice #1093

Created: 8/19/2020 03:22 PM CDT
 Invoiced: 1/8/2021 04:46 PM CST
 Service Writer: Jeff Sexton

Custom Engine Harness			2.5	\$300.00
7	Exhaust System (Complete) R&R	\$5,000.00	1	\$5,000.00
8	Engine Management Computer			
	Undecided		10	\$1,200.00
9	Replacing Cooling and Water lines as Needed			
10	2002 and 2004 Thunderbird Wiring Harness Access Alldata	\$54.02	1	\$54.02
11	Build an interface to determine the efficacy of the 2004 Thunderbird for the required application.		5	\$600.00
Includes research and calling vendors and experts to develop the available options and quotes moving forward.				
		Shop Supplies (5%): \$623.00	Tax (6.25%): \$417.31	Total: \$19,554.33

Custom Rack		Price	QTY	Subtotal
	Description	\$346.40	1	\$346.40
1	Metals 4 U Supply for Dolly	\$97.25	1	\$97.25
2	Paint & Brushes	\$73.32	4	\$293.28
3	Caster 8 Swivel			
		Tax (6.25%): \$6.08		Total: \$743.01

Remove and repair camshafts		HRS	Subtotal	
	Description	3	\$360.00	
1	R&R camshafts			
		Shop Supplies (5%): \$18.00	Tax (6.25%): \$1.13	Total: \$379.13

Thank you for your business. The work is complete and your payment is due upon pickup of the vehicle. Please contact us promptly if you have any questions, comments or concerns. We would appreciate any feedback that may help us better serve you and all of our customers.

Mechanic liens may be placed on vehicles until balance for services are paid in full. Additional storage fees may be applied to abandoned vehicles or vehicles that are left for more than 2 days after services are completed. If customers not have made prior arrangements with Hammer Down Motorsports Management.

Thank you
 The Staff at Hammer Down Motorsports

Signature _____

Parts	\$6,790.95
Labor	\$13,750.00
Subtotal	\$20,540.95
Shop Supplies	\$687.50
Tax	\$427.42
Grand Total	\$21,655.87
Paid To Date	(\$5,660.00)

REMAINING BALANCE \$15,995.87

From: Jacques Terre Williams terre328@gmail.com
Subject: Fwd: Receipt from HD MOTORSPORTS, LLC (Transaction #10411013-6303)
Date: Jan 19, 2021 at 2:46:51 PM



Terre Williams
mobile: (512) 800-2421



T-Bird
2

----- Forwarded message -----

From: HD MOTORSPORTS, LLC <noreply@swipesimple.com>
Date: Tue, Jan 19, 2021 at 12:42 PM
Subject: Receipt from HD MOTORSPORTS, LLC (Transaction #10411013-6303)
To: <Terre328@gmail.com>

HD MOTORSPORTS, LLC

2118 DOWNING LN. STE. 120. LEANDER, TX 78641

TRANSACTION #	10411013-6303
DATE	01/19/2021 12:42 PM
RESULT	APPROVED
AUTH CODE	09728G
TRANSACTION METHOD	INVOICE





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Invoice #1093

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 Service Writer: Jeff Sexton

Terre Williams 9/23/2020 11:45 AM CDT

Thoughts?
 I believe this would be the least complicated route and probably the most cost efficient. The swap route with an AJ27S will come with an existing harness, ECU & TCU, from there it would be a direct swap in. To get an idea, this would save the \$6,000 in labor & materials to build a custom harness.

Terre Williams

mobile: (512) 800-2421

Todd "Therk" Therkildsen 9/23/2020 11:56 AM CDT

If the engine would be a complete drop in and no other modifications necessary, yes it would save the 6k in custom harness. But realistically, we know it wont just drop in, we will need to remove the old harness and install the new one. But we also don't know what the cost of the new engine and harness will be. I've seen them anywhere from 2k to 14k depending on mileage and condition. I'm not saying its a bad route to take. It might be way cheaper in the long run, maintenance and being able to read OBD2 etc.

Terre Williams 9/23/2020 11:57 AM CDT

Liked "if the engine would be a complete drop in and no other modifications necessary, yes it would save the 6k in custom harness. But realistically, we know it wont just drop in, we will need to remove the old harness and install the new one. But we also don't know what the cost of the new engine and harness will be. I've seen them anywhere from 2k to 14k depending on mileage and condition. I'm not saying its a bad route to take. It might be way cheaper in the long run, maintenance and being able to read OBD2 etc."

Terre Williams 9/23/2020 11:58 AM CDT

What was the mileage on the unit that was \$14,000

Todd "Therk" Therkildsen 9/23/2020 11:59 AM CDT

I believe it was a Brand new crate engine with harness.

Terre Williams 9/23/2020 12:00 PM CDT

Copy. Btw is it possible to only get emails? Instead of both a text and a email



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Estimate #1093

Created, 8/19/2020 03:22 PM CDT
 Service Writer, Todd "Therk" Therkildsen

Charles Amos

2/3/2021 8:10 AM CST



Todd "Therk" Therkildsen

4/27/2021 1:48 PM CDT

Hi Terre,

Below is a link to the estimate you requested from HD Motorsports, LLC. Please review and let us know if you have any questions.

File: Estimate_1093_-_Ford_Thunderbird_-_T_erre_Williams_-_2002_Ford_Thunderbird_Base.pdf

Todd "Therk" Therkildsen

8/19/2021 2:59 PM CDT

Hi Dale,

Below is a link to the estimate you requested from HD Motorsports, LLC. Please review and let us know if you have any questions.

File: Estimate_1093_-_Ford_Thunderbird_-_Dale_Mcpherson_-_2002_Ford_Thunderbird_Base.pdf

8/19/2021 10:23 PM CDT

Therk,
 At \$44,000, I would like to think that tidying up and touching up paint in the engine bay would be included. I trust this estimate is now more "actual" now that we are past the fact finding and unknowns?
 I will get the latest \$4K invoice paid, tonight and plan to drop in next week for a review.
 I hope we are getting to sunset, now.
 Thanks.



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Created: 8/19/2020 03:22 PM CDT
Service Writer: Todd "Therk" Therkildsen

Engine			
34	Swivel Seal Hose Ends Note: Ord 10/26- Due 10/27	\$24.50 1	\$24.50
35	Swivel Seal Hose Ends Note: Ord 10/26- Due 10/27	\$54.60 3	\$163.80
36	Performance Reducers Note: Ord 10/26- Due 10/27	\$16.20 1	\$16.20
37	Full Flow Hose Ends Note: Ord 10/26- Due 10/27	\$30.14 4	\$120.56
38	3/8 NPT- 5/8 Barb Note: Ord 11/3- Due 11/4	\$26.44 1	\$26.44
39	5/8-3/4 Barb Note: Ord 11/3- Due 11/4	\$10.80 1	\$10.80
40	1/2 Barb Tee Note: Ord 11/3- Due 11/4	\$9.10 1	\$9.10
41	-8 AN-1/2 Barb Note: Ord 11/3- Due 11/4	\$6.50 2	\$13.00
42	-8 AN 90 Deg Note: Ord 11/3- Due 11-4	\$38.80 2	\$77.60
43	-8 AN Straight Note: Ord 11/3- Due 11/4	\$15.90 1	\$15.90
44	-8 Braided Nylon Fuel Line Note: Ord 11/3- Due 11/4	\$156.14 1	\$156.14
45	Atech Shipping #9485		\$7.00
46	1/2" Heater Hose Note: Ord 11/3- Due Same Day	\$3.22 12	\$38.64
47	5/8" Heater Hose Note: Ord 11/3- Due Same Day	\$2.33 8	\$18.64
48	1/2-3/4 Barb Note: Ord 11/3- Due 11/4	\$21.14 2	\$42.28
49	Fuel Pressure Gauge Adapter Note: Ord 11/4- due 11/5	\$31.10 1	\$31.10
50	Atech Shipping #0286		\$14.00
51	3/4-1/2 Hose Barb Note: Ord 11/3- Due 11/5	\$21.14 2	\$42.28
52	Fuel Pressure Sensor Note: Ord 11/22- Due 3-5 Days	\$262.50 1	\$262.50
53	Racing Solutions Shipping #		\$19.50
54	Thermostat	\$21.98 1	\$21.98
55	Install fuel pressure sensor		1 \$130.00
Shop Supplies (5%)		\$138.50	
Tax (6.25%)		\$152.70	
Total			\$5,889.76



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Service Writer: Todd "Therk" Therkildsen

Charles Amos 9/16/2020 7:49 AM CDT
transmissions)

[Redacted] 9/16/2020 11:01 AM CDT

Thanks, Would you recommend taking fluid samples of engine oil, trans fluid & Diff fluid to get an idea of overall conditions?

Terre Williams

mobile: (512) 800-2421

Todd "Therk" Therkildsen 9/16/2020 11:05 AM CDT

Terre,

I would highly recommend this at this point. We had the car on the lift, The exhaust on this car is pretty rotted out. That will need to be addressed at some point if this car becomes a runner.

[Redacted] 9/16/2020 11:08 AM CDT

I'm pretty free today. I'll stop by

Todd "Therk" Therkildsen 9/18/2020 9:32 AM CDT

Hi Terre,

Below is a link to the estimate you requested from HD Motorsports, LLC. Please review and let us know if you have any questions.

File: Estimate_1093_-_Ford_Thunderbird_-_T_erre_Williams_-_2002_Ford_Thunderbird_Base.pdf

[Redacted] 9/22/2020 11:56 AM CDT

Good morning guys,
What do you guys think about swapping the existing ford specific 3.9 litre for a later production year (2000-2003) Jaguar 4 litre (AJ275) Supercharged out of a XKR or XJR? Physically the engines are identical minus the shorter stroke of the ford variant. I feel like this could be a good idea, but also i feel like this idea could just complicate things thoughts?



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Engine				
7	Valve Cover Gasket	\$78.53	1	\$78.53
8	Cam Tool		1	\$0.00
9	Crank Bolt 6A340	\$52.60	1	\$52.60
10	Oil Filter	\$5.58	1	\$5.58
11	90 Deg NPT fitting	\$38.94	2	\$77.88
12	NPT Coupler	\$18.64	1	\$18.64
13	Heater Hose	\$28.56	1	\$28.56
14	Heater Hose	\$46.35	1	\$46.35
15	Atech Shipping #3252835			\$15.00
16	Brass Fitting 3/4 Barb to 3/4 Male Pipe	\$18.12	1	\$18.12
17	3/4" Hose Barb 90 Elbow	\$26.25	3	\$78.75
18	Hose Note: ORD 9/15- DUE 9/16	\$39.03	2	\$78.06
19	Bushing Note: Ord 9/15- Due 9/16	\$20.74	2	\$41.48
20	Fitting Note: Ord 9/15- Due 9/16	\$19.50	1	\$19.50
21	8AN Fern Swivel 90 Note: Ord 9/15- Due 9/16	\$40.95	4	\$163.80
22	-8AN MALE TEE Note: Ord 9/15- Due 9/16	\$29.23	2	\$58.46
23	-8 ST AUTO FITTING Note: Ord 9/15- Due 9/16	\$17.76	8	\$142.08
24	Fuel Fitting Note: Ord 9/15- Due 9/16	\$46.32	1	\$46.32
25	Atech Shipping #21948671			\$15.00
26	-8AN Fern to 1/2" NPT Male Swivel Note: Ord 9/16- Due 2-3 Days	\$59.95	1	\$59.95
27	3/4" NPT to 3/4" NPT Fern Coupling Note: Ord 9/16- Due 2-3 Days	\$39.53	2	\$79.06
28	Holley Shipping #463459			\$15.00
29	2"X1/8"X36" Aluminum Strip	\$14.62	1	\$14.62
30	Black Nylon Hose Note: Ord 9/22- Due 9/23	\$178.75	1	\$178.75
31	Atec Shipping #455050			\$7.00
32	ANO Tuff Fitting Note: Ord 10/21- Due 10/22	\$14.90	4	\$59.60
33	Atech Shipping #6684			\$5.99



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Todd "Therk" Therkildsen

11/23/2020 8:26 AM CST

Option 2. If stock PCM cannot run engine effectively, it may be piggybacked with an aftermarket PCM compatible with camshaft and crankshaft sensors of engine. Would give tuning capabilities to the engine, but no way of anticipating the stock PCM's compatibility in this setup. Could require extensive testing to ensure dual-PCM compatibility. Harness options range anywhere between repair, patching, and full custom harness. May build capabilities into the harness to expand into option 3 in the event there are problems using stock PCM. Still no way to edit shift points or line pressure or any other transmission parameters that would ensure driveability.

Option 3. Use aftermarket PCM and different transmission. May have fitment issues, but would have full tuning capabilities and can therefore guarantee driveability. AJ V8 in 4.0 supercharged XK8/XKR used W5A580 Mercedes transmission (same as Chrysler NAG-1), which does have aftermarket support. This option would allow for full tuning of engine and transmission, but could require substantial modification to the vehicle for fitment and substantial tuning and wiring hours. Still need to confirm bellhousing compatibility. Would guarantee the vehicle would pass emissions and be able to be registered for road use.

Charles Amos

12/8/2020 1:45 PM CST

More information:

36-1 (35 teeth total) teeth on the crankshaft wheel
 1 tooth on the camshaft
 1998-2002 Jaguar Supercharged XKR transmission appears to have the same bolt pattern as our AJV8 transmission.

Todd "Therk" Therkildsen

1/15/2021 11:00 AM CST

Hi Terre,

Below is a link to the invoice you requested from HD Motorsports, LLC. Please review and let us know if you have any questions.

File: [Invoice_1093_-_Ford_Thunderbird_-_T.erre.Williams_-_2002_Ford_Thunderbird_Base.pdf](#)

Charles Amos

2/3/2021 8:10 AM CST

Here are pictures of the valve covers. They have chips and blemishes in the paint. Would you like us to have these repainted?



12/9/2021

HD Motorsports, LLC
 Powered by Shopmonkey.io

Page 15 of 18



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Estimate #3037

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 Payment Term: On Receipt
 Service Writer: Todd 'Therk' Therkildsen

Thunderbird Mirrors

Shop Supplies (6%): \$7.68 Tax (6.25%): \$35.77 Total: \$1,174.80

Add Secondary Resonators On Exhaust

In-cabin noise is too loud

Description	Price	QTY	Subtotal
1 Add Secondary Resonators to Exhaust	\$846.95		\$846.95
2 Tow from HD to Walker Pro 4/13	\$178.75		\$178.75
3 Tow from Walker Pro to HD 4/14	\$178.75		\$178.75
			Total: \$1,204.45

Steering Wheel Controls

Would like to have steering wheel control function if possible.

Description	Subtotal
	Total: \$0.00

Torque Converter

Find appropriate TC for application. Per Cust, Doesn't shift till after 5K RPM(After warm-up)

Description	Subtotal
	Total: \$0.00

3% CC Fee

Description	Subtotal
1 3% CC Fee 4/25	\$105.18
Total: \$105.18	

Estimates provided are an approximation of timing and charges to you for the services requested. They are based on the anticipated work to be done. It is possible for unexpected complications to cause some deviation from the original quote. You hereby authorize the repair work described in this estimate to be performed along with the procurement of the necessary material(s), including permission to operate the vehicle for on-premises testing or inspection. If any additional services/labor are required, we will prepare a revised work order providing the cost of additional parts and labor and total revised cost. All parts are new unless specified otherwise.

Deposits are non-refundable. No returns or refunds on special ordered items or electrical parts. There is no warranty for used parts or customer supplied parts. If parts are authorized to order, and the customer changes their mind, they will be subject to a 20% restocking/administration fee.

Parts	\$1,870.97
Labor	\$688.00
Subcontract	\$1,635.53
Subtotal	\$4,299.68
Shop Supplies	\$41.28
Fees	\$105.18
Tax	\$116.94
Grand Total	\$4,457.90
Paid To Date	(\$0.00)

REMAINING BALANCE \$4,457.90

You agree that we are not responsible for loss or damage to your vehicle, including loss of articles left in the vehicle, including, without limitation, in case of



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Charles Amos

12/8/2020 1:45 PM CST

More information:

36-1 (35 teeth total) teeth on the crankshaft wheel
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1998-2002 Jaguar Supercharged XKR transmission appears to have the same bolt pattern as our AJV8
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2002 Ford Thunderbird Base (Silver)
 VIN: 1FAHP60A82Y100397
 License Plate: N/A
 Last Recorded Mileage: 231

Customer Comments

Make sure Brake fluid and transmission fluid have been last visit.

Find Source of the Rubbing

Description	HRS	Subtotal
1 Determine the Cause of the Rubbing <i>Note: Removed front wheels shocked any rub Rasheed areas took pictures, placed front on jack stands re installed wheels had steering wheel lock to lock and found rub points.</i>	1	\$160.00
Shop Supplies (6%): \$9.60		Total: \$169.60

Shocks

Description	Price	QTY	HRS	Subtotal
1 R&R Both Front/Rear Shocks <i>Note: Removed front wheels removed sway bars links to gain access to struts removed strut, during visual inspection noticed that both sway bar endlinks were blown out recommend replacement along with lower ball joint. Re installed new struts and torqued everything to spec. Removed rear wheels and sway bar links, removed trunk trim to gain access to strut tower, removed strut, during visual inspection noticed both blown out sway bars and a blown out upper and lower ball joint, installed new strut and reinstalled trunk trim torqued to spec. All wheels torqued to spec. 100 ft-lbs</i>			2.5	\$400.00
2 Rear Struts	\$299.14	2		\$598.28
3 Front Left Strut	\$350.21	1		\$350.21
4 Front Right Strut	\$350.21	1		\$350.21
Shop Supplies (6%): \$24.00		Tax (6.25%): \$81.17		Total: \$1,803.87

Thunderbird Mirrors

Description	Price	QTY	HRS	Subtotal
1 R&R Door Mirrors			0.8	\$128.00
2 Paint Mirror Caps to Match Body Color	\$431.08			\$431.08
3 Driver Door Mirror Assembly	\$228.52	1		\$228.52
4 Passenger Door Mirror Assembly	\$237.85	1		\$237.85
5 Driver Mirror Caps	\$52.82	1		\$52.82
6 Passenger Mirror Caps	\$53.08	1		\$53.08



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Final assembly

needs the signal for drive ability and tuning. The current I.A.C. installed has a vacuum line added to it. Chuck & Jon had not developed a solution to this at this time. This needs to be addressed. Brackets need to be made to secure the ECU and other engine management components. Removed and existing fuel line fitting to verify that it is -6 AN and to check for space for possible routing of the fuel line an adapters necessary to add a fuel pressure sensor. Searched for a fuel pressure transducer that would work for the application. Got in touch with Jon and wrote an email. Searched for -6 adapter to add fuel pressure sensor.

5	Wire super charger coolant pump		1.5	\$195.00
6	Final under hood assembly		5	\$650.00
7	Foam Tape	\$9.52	1	\$9.52
		Shop Supplies (5%), \$110.50	Tax (6.25%), \$7.50	Total, \$2,337.52



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Past Authorizations

9/26/2023 at 1:39 PM CDT		- \$1,355.00
In App by Ramon Martinez	+ Transmission	\$7,056.73
9/26/2023 at 8:21 AM CDT		+\$448.80
In App by Ramon Martinez	- Transmission	\$6,607.93
9/26/2023 at 8:21 AM CDT		-\$448.80
[Redacted]	+ Arrival Test Drive/ Final QC	\$6,788.13
9/8/2023 at 11:25 AM CDT	+ Engine	
	+ Transmission	
	+ Find Source of the Rubbing	
[Redacted]	+ 3% CC Fee	\$6,486.56
9/3/2023 at 6:51 PM CDT	+ Engine	+\$112.41
[Redacted]	+ Find Source of the Rubbing	\$6,366.68
5/3/2023 at 6:51 PM CDT	+ Shocks	+\$1,908.78
	+ Thunderbird Mirrors	
	+ Add Secondary Resonators On Exhaust	
	+ Steering Wheel Controls	
	+ Torque Converter	
	+ Suspension	
	+ Alignment	
	+ 3% CC Fee	
[Redacted]	+ Find Source of the Rubbing	\$4,457.90
4/26/2023 at 2:49 PM CDT	+ Shocks	+\$105.18
	+ Thunderbird Mirrors	
	+ Add Secondary Resonators On Exhaust	
	+ Steering Wheel Controls	
	+ Torque Converter	
	+ 3% CC Fee	
[Redacted]	+ Add Secondary Resonators On Exhaust	\$1,727.32
4/11/2023 at 9:47 AM CDT	+ Find Source of the Rubbing	
	+ Shocks	
	+ Steering Wheel Controls	
	+ Thunderbird Mirrors	
	+ Torque Converter	

Needs Response



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9/22/2020 11:56 AM CDT

Terre Williams

9/22/2020 8:51 PM CDT

Todd "Therk" Therkildsen

If we can do a swap with the engine and transmission with all of the AJ27S harness and ECU and TCU then it might be a good idea. If we go any other way with that plan it might complicate things. Im still trying to figure out exactly what transmission and TC controller is in the car. You have a lead on a AJ27S swap power plant?

9/23/2020 11:38 AM CDT

No lead atm. I'm currently looking.

9/23/2020 11:45 AM CDT

Thoughts?

I believe this would be the least complicated route and probably the most cost efficient. The swap route with an AJ27S will come with an existing harness, ECU & TCU, from there it would be a direct swap in. To get an idea, this would save the \$6,000 in labor & materials to build a custom harness.

Terre Williams

9/23/2020 11:56 AM CDT

Todd "Therk" Therkildsen

If the engine would be a complete drop in and no other modifications necessary, yes it would save the 6k in custom harness. But realistically, we know it wont just drop in, we will need to remove the old harness and install the new one. But we also don't know what the cost of the new engine and harness will be. I've seen them anywhere from 2k to 14k



HD Motorsports, LLC
2118 Downing Lane
Suite 120
Leander, TX 78641
(512) 886-3443
service@hdmstx.com
www.hdmstx.com

Invoice #1093

Created: 8/19/2020 03:22 PM CDT
Invoiced: 1/8/2021 04:46 PM CST
Service Writer: Jeff Sexton

Terre Williams

11/14/2020 12:51 PM CST

Good afternoon a little getting to this. There was mention of bench testing the engine & transmission, sounds like a good idea & I'll say go for it.

Todd "Therk" Therkildsen

11/23/2020 8:26 AM CST

Supercharged 2004 Ford Concept Vehicle

Customer needs to decide if the vehicle needs to pass emissions (needed for vehicle registration). If so, the extent of testing and development could be much more than the case where it does not need to pass emissions. It is recommended in any case that the engine and transmission be run on a test stand (to be built) to ensure the engine and transmission run well before installation into vehicle. A custom extension cable may be built to communicate with the body harness to check gauges and functionality.

(Listed in order of increasing complexity, parts required, and modifications)

Option 1 - Use the stock PCM (No tuning capabilities). Fix/replace harness and ensure all sensors are plugged in and working properly. Can read engine codes for faults. May be able to use externally-monitored wideband O2 sensors and externally-monitored knock sensors to check the efficacy of the stock PCM for supercharged application. Will not be able to tune engine or transmission for driveability. Can only run as good as it ran originally.

Option 2: If stock PCM cannot run engine effectively, it may be piggybacked with an aftermarket PCM compatible with camshaft and crankshaft sensors of engine. Would give tuning capabilities to the engine, but no way of anticipating the stock PCM's compatibility in this setup. Could require extensive testing to ensure dual-PCM compatibility. Harness options range anywhere between repair, patching, and full custom harness. May build capabilities into the harness to expand into option 3 in the event there are problems using stock PCM. Still no way to edit shift points or line pressure or any other transmission parameters that would ensure driveability.

Option 3: Use aftermarket PCM and different transmission. May have fitment issues, but would have full tuning capabilities and can therefore guarantee driveability. AJ VB in 4.0 supercharged XKB/XXR used W5A580 Mercedes transmission (same as Chrysler NAG-1), which does have aftermarket support. This option would allow for full tuning of engine and transmission, but could require substantial modification to the vehicle for fitment and substantial tuning and wiring hours. Still need to confirm bellhousing compatibility. Would guarantee the vehicle would pass emissions and be able to be registered for road use.



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 2118 Downing Lane
 Suite 120
 Leander, TX 78641
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Diagnostics			
Description	HRS	Disc	Subtotal
1 Diagnostics	8	10%	\$864.00
2 Remove Top of Manifold to Determine The rest of the sensors on the back side of the engine	3	10%	\$324.00
3 Clean Underside of Car Cobbwebs and dead insects, Rat and Mouse Feces	1.5	10%	\$162.00
4 Remove Engine Covers	0.25	10%	\$27.00
Shop Supplies (5%), \$68.85 Tax (6.25%), \$4.30			Total \$1,450.15

Custom Engine Harness

Removal of intercooler surge tank, hoses, and upper intake manifold, intake hose and throttle body. Disconnecting harness and removal of hoses attached to engine.
 Removal of intercooler heat exchanger, coolant and heater hoses, wheels and inner fender wells.
 Removal of body braces, intercooler pump, alternator, and serpentine belt.
 Removal of air conditioning compressor, beauty skirts, exhaust, driveshaft, and A/C lines.
 Prepping the engine and transmission for removal from vehicle including disassembly of front suspension, removal of hydraulic pump, and removal of residual wiring harness.
 Finished removal of engine and trans from vehicle including removal of last hydraulic pump and remaining wiring harness plugs.
 Removal of supercharger and intercoolers from intake manifold.
 Cleaning of engine and removal of remaining engine wiring harness.

Identification of pinouts for the wiring harness, building an interface to communicate with the stock PCMs, and generally cleaning up the engine and prepping it for harness measurements. Calling vendors to find solutions and quotes for the PCM and TCM, and all the difficulty that that entails.

Identification of wiring harness plugs and pin out locations for PCM
 Building interface to communicate with PCMs for both the 2002 and the 2004 thunderbird
 Determination of crankshaft and camshaft tooth count for aftermarket PCM compatibility. Includes removal of coil packs, and valve cover.
 Determination of crankshaft and camshaft tooth count for aftermarket PCM compatibility. Includes removal of coil packs, and valve cover.
 Calling vendors to find PCM and TCM solutions for engine and transmission. Also coordinating activities on wiring harness with Jon Ethridge.
 Separation of transmission from engine, removal of engine harness, and mounting of engine-on-engine stand.
 Removal of valve covers, harmonic balancer/crank pulley, timing cover, timing chains, and chain tensioners.
 Coordination of procedure for engine/transmission harness build.

Description	Price	QTY	HRS	Disc	Subtotal
1 Replacing sensors as needed			3.5	10%	\$378.00
2 Engine Assembly R&I Compression Check and Lookdown after Engine Removal			25	10%	\$2,700.00
3 Measurements for Engine Harness			7	10%	\$756.00
4 Trans Assembly R&I			6	10%	\$648.00
5 Exhaust System (Complete) R&R			3.8	10%	\$410.40
6 Replacing Cooling and Water lines as Needed Rebuild plumbing that wasn't run correctly from design <i>Note: Re-engineered supercharger cooling system to</i>			10	10%	\$1,080.00



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Invoiced: 1/8/2021 04:46 PM CST
Service Writer: Jeff Sexton

Notes

Charles Amos

9/16/2020 7:49 AM CDT

To All

Here is the information I have found so far on the Thunderbird:

2002 Ford Thunderbird
Engine: 3.9 A.J.-30 Supercharged Engine (390HP/390TQ according to <https://www.caranddriver.com/news/a15136084/ford-supercharged-thunderbird-auto-shows/>)
RF-XW43-6015-DJ (No information from Ford on this engine. Last 8 digits of VIN are stamped into the block and transmission)
RM-2W4J-6006-AA (Engine listed by VIN but obviously different than the one in the car)
Transmission: 5R55N 5 speed
1W4P-AA
R,J,L-L (Transmission Code)
007660 (Serial Number)
BD-1D20 (Build Date April 20th 2001)

Additional Links:

[https://en.wikipedia.org/wiki/Ford_Thunderbird_\(eleventh_generation\)](https://en.wikipedia.org/wiki/Ford_Thunderbird_(eleventh_generation))
<http://www.portholeauthority.com/thenevtbird/concept/super.html>
<http://www.drivingenthusiast.net/sec-ford/FMC-concepts-prototypes-showcars/thunderbird-supercharged/default.htm>
<http://www.drivingenthusiast.net/sec-blog/2010/07/19/several-recent-ford-concepts-to-be-auctioned-by-rm/>
<http://www.drivingenthusiast.net/sec-blog/2015/10/02/thunderbird-ford-built/>
<http://www.super7thheaven.co.uk/components/jaguar-aj-v8/>
https://www.sonnax.com/tech_resources/195-figuring-out-the-5r55-alphabet
<https://shop.ukrtrans.biz/wp-content/uploads/catalogs/5R55S.pdf> (Not on the 5R55N, but on the same family of transmissions)

Terre Williams

9/16/2020 11:01 AM CDT

Thanks, Would you recommend taking fluid samples of engine oil, trans fluid & Diff fluid to get an idea of overall conditions?

Terre Williams

mobile: (512) 800-2421

1/15/2021

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Leander, TX 78641
(512) 886-3443
service@hdmstx.com
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Invoiced: 1/8/2021 04:46 PM CST
Service Writer: Jeff Sexton

Todd "Therk" Therkildsen 9/16/2020 11:05 AM CDT

Terre,

I would highly recommend this at this point. We had the car on the lift, The exhaust on this car is pretty rotted out. That will need to be addressed at some point if this car becomes a runner.

Terre Williams 9/16/2020 11:08 AM CDT

I'm pretty free today, I'll stop by

Todd "Therk" Therkildsen 9/18/2020 9:32 AM CDT

Hi Terre,

Below is a link to the estimate you requested from HD Motorsports, LLC. Please review and let us know if you have any questions.

File: Estimate_1093_-_Ford_Thunderbird_-_T_erre_Williams_-_2002_Ford_Thunderbird_Base.pdf

Terre Williams 9/22/2020 11:56 AM CDT

Good morning guys,

What do you guys think about swapping the existing ford specific 3.9 litre for a later production year (2000-2003) Jaguar 4 litre (AJ27S) Supercharged out of a XKR or XJR? Physically the engines are identical minus the shorter stroke of the ford variant. I feel like this could be a good idea, but also I feel like this idea could just complicate things. thoughts?

Terre Williams:

mobile: (512) 800-2421

Todd "Therk" Therkildsen 9/22/2020 8:51 PM CDT

If we can do a swap with the engine and transmission with all of the AJ27S harness and ECU and TCU then it might be a good idea. If we go any other way with that plan it might complicate things. Im still trying to figure out exactly what transmission and TC controller is in the car. You have a lead on a AJ27S swap power plant?

Terre Williams 9/23/2020 11:38 AM CDT

No lead atm, I'm currently looking.

1/15/2021

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Suite 120
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info@hdmstx.com
www.hdmstx.com

Estimate #1093

Created: 8/19/2020 03:22 PM CDT
Service Writer: Todd "Therk" Therkildsen

Charles Amos

11/9/2020 10:36 AM CST

as well. In the service manuals between the two types of transmissions, they list "control line pressure" vs "variable line pressure", but these differences look to be semantics. There are pin differences on the transmission that will have to be fixed, but the name and number of pins is the same between the transmissions, except for the previously mentioned reverse pressure switch. It looks like the newer computer (2004) could run the older transmission, but there is a chance the differences are too great in the programming that can't be anticipated. We will only be able to know once we have the engine and transmission wired up. We may have to bench test the engine and transmission combination before putting it back in the car. If the transmission differences are too great, we may need to purchase a replacement 5R55S (03+) transmission with the correct bell housing, if we pursue this direction.

The engine differences are not as extensive as with the transmissions. The engine we have is the AJ30 3.9 liter V8. The AJ35 is the 03+ engine, which appears to have variable valve timing and electronic throttle control. We are currently looking into the newer 2004 PCM to determine its effectiveness at running a supercharged engine. We will also determine if the electronic throttle and variable valve timing can be bypassed in order to run the earlier AJ30 engine that is in the Thunderbird.

More Resources.

<https://www.explorerforum.com/forums/threads/whats-the-difference-with-the-various-5r55-transmissions.241131/>
<http://www.ratiotek.com/5r55w-complete.pdf>
http://maybeme.com/Storage/JagTech/ManualsHandbooksTSBs/Jaguar%20fault%20codes/5R55N_TRANS_OBDII.pdf
<https://shop.ukrtrans.biz/wp-content/uploads/catalogs/5R55N.pdf>

11/14/2020 12:51 PM CST

Good afternoon a little getting to this. There was mention of bench testing the engine & transmission, sounds like a good idea & I'll say go for it.

Todd "Therk" Therkildsen

11/23/2020 8:26 AM CST

Supercharged 2004 Ford Concept Vehicle

Customer needs to decide if the vehicle needs to pass emissions (needed for vehicle registration). If so, the extent of testing and development could be much more than the case where it does not need to pass emissions. It is recommended in any case that the engine and transmission be run on a test stand (to be built) to ensure the engine and transmission run well before installation into vehicle. A custom extension cable may be built to communicate with the body harness to check gauges and functionality.

(Listed in order of increasing complexity, parts required, and modifications)

Option 1 : Use the stock PCM (No tuning capabilities). Fix/replace harness and ensure all sensors are plugged in and working properly. Can read engine codes for faults. May be able to use externally-monitored wideband O2 sensors and externally-monitored knock sensors to check the efficacy of the stock PCM for supercharged application. Will not be able to tune engine or transmission for driveability. Can only run as good as it ran originally.

12/9/2021

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Estimate #1093

Created: 8/19/2020 03:22 PM CDT
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Custom Engine Harness

properly flow in order to cool the supercharger pump properly.

Built custom mounting brackets for the inter cooler radiator.

Plumbed cooling system using custom AN hose fittings for the feed side of the heat exchangers on the engine and custom heater hoses to run to the electric pump and back to the reservoir tank

Wired the supercharger cooling pump to be ON in the run/start mode.

NOTE: vehicle cannot be left with the key on and the battery on, this will kill the battery due to the supercharger cooling system set up.

7	Build an interface to determine the efficacy of the 2004 Thunderbird for the required application	51.1	10%	\$5,518.80
	Includes research and calling vendors and experts to develop the available options and quotes moving forward.			
8	Measure Injector and Coil Resistance.	2	10%	\$216.00
9	Identify all PCM dependencies for proper transmission operation. Requires pinout identification as well as wiring harness continuity measurements. Build Schematic for harness Builder	2	10%	\$216.00
10	Links Engine Management Computer	\$5,000.00	1	\$5,000.00
11	Misc Parts Estimate	\$1,000.00	1	\$1,000.00
12	2002 and 2004 Thunderbird Wiring Harness Access Alldata	\$54.02	1	\$54.02
13	Custom Engine Harness	\$11,866.72		\$11,866.72
14	Install Custom Engine Harness Custom layout in the engine bay and chassis Made sure harness is protected from heat and outside variables Secured harness in locations to maintain factory look	28.5	10%	\$3,334.50
15	Install Engine and Cradle Install Radiator and Intercooler Program Fan with new temperature sensors Install Coils and Plugs Install Steering shaft and hardware Check CEL after engine install	15	10%	\$1,755.00



HD Motorsports, LLC
 2118 Downing Lane
 Suite 120
 Leander, TX 78641
 (512) 886-3443
 info@hdmstx.com
 www.hdmstx.com

Invoice #3037

Created: 1/31/2023 10:57 AM CST
 Completed: 9/26/2023 03:10 PM CDT
 Invoiced: 9/27/2023 08:44 AM CDT
 Payment Term: On Receipt
 Service Writer: Todd 'Therk' Therkildsen



2002 Ford Thunderbird Base (Silver)
 VIN: 1FAHP60A82Y100397
 License Plate: N/A
 Mileage: No vehicle odometer

Customer Comments	Recommendations
Make sure Brake fluid and transmission fluid have been last visit.	Talked with vendors and they seem to believe it is a Tune or bad sensor in the transmission

Arrival Test Drive/ Final QC

Test drive vehicle upon arrival to ensure there are no driveability issues, malfunction indicator lamps on or suspension and steering issues.

Description	Subtotal
1 Arrival Test Drive	\$0.00
2 QC Checklist	\$0.00
Total: \$0.00	

Engine

Description	Price	QTY	HRS	Subtotal
1 R&R Supercharger Belt			1	\$160.00
The custom bracket for the idler for the supercharger belt needed to be modified and repaired, after multiple drives we found that it was designed to be strong enough to hold the idler where it needed to be.				
2 Supercharger Belt	\$25.99	1		\$25.99
3 Fuel 93	\$25.00	1		\$25.00
Shop Supplies (6%): \$9.60 Tax (6.25%): \$3.19				Total: \$223.78

Transmission

. Per Cust, Doesn't shift till after 5K RPM(After warm-up)
 Talked with multiple vendors and they seem to believe it is a Tune or bad sensor in the transmission

Description	Price	QTY	HRS	Subtotal
1 Drain and Inspect Fluid <i>Note: Drained and inspected fluid for any debris. No debris was found, just found low on fluid. Topped off with new Mercon V fluid and concern stayed the same</i>			2	\$340.00
2 Mercon V Trans Fluid	\$10.40	8		\$83.20
Shop Supplies (6%): \$20.40 Tax (6.25%): \$5.20				Total: \$448.80

Shocks

Description	Price	QTY	HRS	Subtotal
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HD Motorsports, LLC
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Suite 120
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info@hdmstx.com
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Estimate #1093

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Service Writer: Todd "Therk" Therkildsen

- Replacement of rusty parts*
- Add eccentrics to suspension
- Trim firewall studs- C0mplete

Replacement parts list.

Rear sway bar end links
Rear tension rods
Front sway bar end links
Upper/Lower ball joints
Front tie rods
DR P/S reservoir hose

*Rusty parts list.

Hood latch loop
Hood nuts
Pinch weld beauty covers (need to be replaced)
Muffler-back exhaust (maybe entire exhaust)
Camshaft
Crank pulley
Rocker spacers
Firewall brackets
Driveshaft?
Frame X Brace
Brake line fittings and protective coil wrap

Informational discussions with the wiring harness builder. Examples of discussions and subsequent tasks completed include.

-Measurements of the internal resistance of the fuel injectors (14-15 Ohms) and ignition coils (500-600 mOhms) to determine correct gauge wire for the wiring harness.

-Physical confirmation of firing order and cylinder numbering. Contradictory available information for this year of engine required physical inspection.

-Identification of body harness wiring dependencies. Examples include mass air flow sensor, which is part of the body harness, but necessary for proper engine operation. Also, cruise control inputs, brake pedal pressure, overdrive control, and manual shift functionality, all of which are related to vehicle speed and proper transmission function.

Additional work includes.

Continued assembly of engine with valve covers.

Oil and oil filter changed

Physical building of the wiring harness has begun. Includes cutting individual circuits to length before proper twisting can occur



HD Motorsports, LLC
211B Downing Lane
Suite 120
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www.hdmstx.com

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Created: 8/19/2020 03:22 PM CST
Invoiced: 1/8/2021 04:46 PM CST
Service Writer: Jeff Sexton

Terre Williams

11/4/2020 10:31 AM CST

Copy:

fyi. some literature on the SR55 <https://www.thetransmissionshop.com/forde-four-versions-of-sr55/>

Terre Williams

mobile: (512) 800-2421

Charles Amos

11/9/2020 10:36 AM CST

Good Morning,

Here is some updated information:

The SR55N (2002) and SR55W (2003+) have internal differences within the transmission. The SR55a/SR55w are both "synchronous" units, as they do not use the intermediate clutch and intermediate sprag that the SR55N incorporates. There is also one pin different on the transmission plug, which includes a simple reverse pressure switch SR55N. The control strategies for shifting the two transmissions look identical. The solenoid resistances all appear to be the same as well. In the service manuals between the two types of transmissions, they list "control line pressure" vs "variable line pressure," but these differences look to be semantics. There are pin differences on the transmission that will have to be fixed, but the name and number of pins is the same between the transmissions, except for the previously mentioned reverse pressure switch; it looks like the newer computer (2004) could run the older transmission, but there is a chance the differences are too great in the programming that can't be anticipated. We will only be able to know once we have the engine and transmission wired up. We may have to bench test the engine and transmission combination before putting it back in the car. If the transmission differences are too great, we may need to purchase a replacement SR55S (03+) transmission with the correct bell housing, if we pursue this direction.

The engine differences are not as extensive as with the transmissions. The engine we have is the AJ30 3.9 liter V8. The AJ35 is the 03+ engine, which appears to have variable valve timing and electronic throttle control. We are currently looking into the newer 2004 PCM to determine its effectiveness at running a supercharged engine. We will also determine if the electronic throttle and variable valve timing can be bypassed in order to run the earlier AJ30 engine that is in the Thunderbird.

More Resources:

<https://www.exploreforum.com/forums/threads/whats-the-difference-with-the-various-sr55-transmissions.241131/>
<http://www.ratiotek.com/sr55w-complete.pdf>
http://maybeme.com/Storage/JagTech/Manuals/landbooks/TSBs/Jaguar%20fault%20codes/SR55N_TRANS_OBIII.pdf
<https://shop.uktrans.biz/wp-content/uploads/catalogs/SR55N.pdf>

1/15/2021

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Suite 120
Leander, TX 78641
(512) 886-3443
info@hdmstx.com
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Estimate #1093

Created: 8/19/2020 03:22 PM CDT
Service Writer: Todd "Therk" Therkildsen

2002 Ford Thunderbird Base (Silver)

VIN: TFAHP60A82Y100397
License Plate: N/A

Recommendations

Engine R+ taking longer than expected due to unique nature of the engine and complexity of components. Extensive documentation (photos) of the process is available. Recommend adding additional hours to Engine R+ task.

Supercharged 2004 Ford Concept Vehicle

Customer needs to decide if the vehicle needs to pass emissions for vehicle registration. If so, the extent of testing and development will be much more than the case where it does not need to pass emission. It is recommended in any case that the engine and transmission be run on a test stand (to be built) to ensure the engine and transmission run well before installation into vehicle. A custom extension cable may be built to communicate with the body harness to check gauges and functionality.

(Listed in order of increasing complexity, parts required, and modifications)

Option 1. Use the stock PCM (No tuning capabilities). Fix/replace harness and ensure all sensors are plugged in and working properly. Can read engine codes for faults. May be able to use externally-monitored wideband O2 sensors and externally-monitored knock sensors to check the efficacy of the stock PCM for supercharged application. Will not be able to tune engine or transmission for driveability. Can only run as good as it ran originally.

Option 2. If stock PCM cannot run engine effectively, it may be piggybacked with an aftermarket PCM compatible with camshaft and crankshaft sensors of engine. Would give tuning capabilities to the engine, but no way of anticipating the stock PCM's reaction to having subsystems taken out of its control. For example, aftermarket PCM takes over ignition and fuel, but the stock PCM kick a CEL that puts the transmission into limp mode that we cannot clear because we cannot write to the stock PCM. Could require extensive testing to ensure dual-PCM compatibility. Harness options range anywhere between repair, patching, and full custom harness. May build capabilities into the harness to expand into option 3 in the event there are problems using stock PCM. Still no way to edit shift points or line pressure or any other transmission parameters that would ensure driveability.

Option 3. Use aftermarket PCM and different transmission. May have fitment issues, but would have full tuning capabilities and can therefore guarantee driveability. AJ V8 in 4.0 supercharged XK8/XKR used W5A580 Mercedes transmission (same as Chrysler NAG-1), which does have aftermarket support. This option would allow for full tuning of engine and transmission, but with substantial modification to the vehicle for fitment and substantial tuning and wiring hours. Still need to confirm bellhousing compatibility. Would guarantee the vehicle would pass emissions and be able to be registered for road use. If we use this option, we have contact with Russell Drake at Sound German Automotive. He is the leading expert at running aftermarket TCM with Chrysler NAG-1/WA580 transmission.

To-Do:

- Does not need to pass emissions.
- PCM cost
- Full Custom Harness with dual signal wires for aftermarket and stock PCM. May also include option to expand into aftermarket TCM and a different transmission. ... Complete
- Engine test stand fabrication Complete
- BCM Extension cable to interface with the vehicle - Complete
- Troubleshooting dual-PCM issues - Complete
- Tuning



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Estimate #1093

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 Service Writer: Todd "Therk" Therkildsen

Charles Amos

11/4/2020 8:23 AM CST

Here's an update on the Thunderbird so far.

- We have the engine and transmission out of the car with full access to the wiring harness, which was necessary given the way the supercharger was assembled.
- We have what we are assuming is the original PCM (it was unplugged and in the passenger seat of the Thunderbird) and a 2004 Thunderbird PCM (it was in an envelope in the trunk).
- There does not appear to be any aftermarket support for the stock transmission (5R55N) in terms of a standalone controller.
- The 03-05 Thunderbird does have aftermarket support for tuning through HPTuners, but the transmission was also changed in 2003 from the 5R55N to the 5R55S (we are still determining the extent of the differences between these transmissions).

We have a couple of solutions that we are currently exploring.

- Solution 1: Use the 2004 Thunderbird PCM to run the engine and transmission.
- Solution 2: Use an aftermarket ECU to run the engine, and provide enough information to the stock PCM to run the transmission.

Both solutions would require a custom harness.



11/4/2020 10:31 AM CST

Copy.
 fyi. some literature on the 5R55 <https://www.thetransmissionshop.com/fords-four-versions-of-5r55/>

Terre Williams



Charles Amos

11/9/2020 10:36 AM CST

Good Morning,

Here is some updated information.

The 5R55N (2002) and 5R55S/W (2003+) have internal differences within the transmission. "The 5R55s/5R55w are both "Synchronous" units, as they do not use the intermediate clutch and intermediate sprag that the 5R55N incorporates" There is also one pin different on the transmission plug, which includes a simple reverse pressure switch 5R55N. The control strategies for shifting the two transmissions look identical. The solenoid resistances all appear to be the same



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Estimates provided are an approximation of timing and charges to you for the services requested. They are based on the anticipated work to be done. It is possible for unexpected complications to cause some deviation from the original quote. You hereby authorize the repair work described in this estimate to be performed along with the procurement of the necessary material(s), including permission to operate the vehicle for on-premises testing or inspection. If any additional services/labor are required, we will prepare a revised work order providing the cost of additional parts and labor and total revised cost. All parts are new unless specified otherwise.

Deposits are non-refundable. No returns or refunds on special ordered items or electrical parts. There is no warranty for used parts or customer supplied parts.

You agree that we are not responsible for loss or damage to your vehicle, including loss of articles left in the vehicle, including, without limitation, in case of fire, theft, or any other cause(s) beyond our control.

Totals only include authorized services

Parts	\$9,425.02
Labor	\$23,788.00
Subcontract	\$11,966.72
Subtotal	\$45,278.22
Discount	\$2,101.79
Shop Supplies	\$1,084.31
Fees	\$98.49
Tax	\$596.52
Grand Total	\$44,857.26
Paid To Date	(\$27,660.00)
REMAINING BALANCE \$17,197.26	

We are not responsible for any delays caused by unavailability of parts or delays in delivery of parts by the supplier or transporter. You have the right to know before authorizing any additional repairs what those repairs will be and what they will cost. If required services/labor exceed the authorized estimated amount, we must obtain your approval to perform the services/labor. We will keep you informed and perform only the services/labor that you have authorized.

Please let me know what you think.

Thanks,

Signature _____

Payments

8/19/2021	Other	Swipe 10755633-2147	\$4,000.00
7/21/2021	Other	Swipe 10236136-6241	\$2,000.00
6/16/2021	Other	Swipe 10757697-1079	\$2,000.00
5/12/2021	Other	Swipe 10757670-8677	\$2,000.00
3/29/2021	Other	Swipe 10725241-3274	\$2,000.00
3/29/2021	Other	Swipe 10200084-5872	\$2,000.00
3/11/2021	Other	Swipe 10813097-3049	\$6,000.00
1/20/2021	Other	Swipe 10411013-6303	\$2,000.00
10/20/2020	Other	Swipe 10591350-7690	\$5,000.00
10/6/2020	Other	Swipe Simple (Invoice 0031)	\$660.00

Authorizations

12/9/2021

HD Motorsports, LLC
 Powered by Shopmonkey.io



HD Motorsports, LLC
2118 Downing Lane
Suite 120
Leander, TX 78641
(512) 886-3443
service@hdmstx.com
www.hdmstx.com

Invoice #1093

Created: 8/19/2020 03:22 PM CDT
Invoiced: 1/8/2021 04:46 PM CST
Service Writer: Jeff Sexton

Payments			
10/20/2020	Other	Swipe 10591350-7690	\$5,000.00
10/6/2020	Other	Swipe Simple (Invoice 0031)	\$660.00

Authorizations			
Phone by Terre Williams		+ Custom Rack	\$21,655.87
1/15/2021 at 10:59 AM CST		+ Remove and repair camshafts	+\$1,122.13
In Person by Terre Williams		+ Diagnostics	\$19,844.47
10/28/2020 at 8:04 AM CDT		+ Custom Engine Harness	



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Created: 8/19/2020 03:22 PM CDT
 Service Writer, Todd 'Therk' Therkildsen

Custom Engine Harness

16	Fram Mercon V Quart	\$7.99	0.5		\$4.00
17	Install Cruise Control Bracket		0.5	10%	\$58.50
18	Overheating Note: Found multiple references to stuck thermostat Installed new thermostat and bled engine cooling system. Removed coolant hoses at highest points and pulled vacuum to make sure coolant was at the thermostat Removed bleeder hose cap and pulled vacuum until good constant coolant and no air During bleed procedure electric pump on the right hand side of the engine bay came on, after a couple heat cycles. And the system began to self purge Ran vehicle at 2500 rpm for 30 seconds at a time to verify no air bubbles Test drove vehicle for short period and did not have a boil over or overheat event, and verified cooling system is operating properly.		3	10%	\$351.00
19	Links ECU Bracket Fabrication		1	10%	\$117.00
		Shop Supplies (5%), \$876.96	Tax (6.25%), \$433.44		Total, \$36,774.34

Custom Rack

Total, \$743.01

Engine

	Description	Price	QTY	HRS	Subtotal
1	Engine Maintenance. Rust Clean up. Clean Engine Components that are corroded. Make custom gaskets that are not available. mock up supercharger for harness Supercharger has to be installed before Engine is installed in car			15	\$1,800.00
2	R&R camshafts Time Camshafts			6	\$720.00
3	Oil Change	\$100.00			\$100.00
4	Cam Machining	\$90.57	1		\$90.57
5	Intake Manifold Gasket	\$101.35	1		\$101.35
6	Front Crank Seal				



HD Motorsports, LLC
 2118 Downing Lane
 Suite 120
 Leander, TX 78641
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 service@hdmstx.com
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Invoice #1093

Created: 8/19/2020 03:22 PM CDT
 Invoiced: 1/8/2021 04:46 PM CST
 Service Writer: Jeff Sexton

-Engine Refresh
 -Rebuild supercharger
 -Add eccentrics to suspension
 -Trim firewall studs

Replacement parts list:

Rear sway bar end links
 Rear tension rods
 Front sway bar end links
 Upper/Lower ball joints
 Front tie rods
 DR P/S reservoir hose

*Ruety parts list:

Hood latch loop
 Hood nuts
 Pinch weld beauty covers (need to be replaced)
 Muffler-back exhaust (maybe entire exhaust)
 Camshaft
 Crank pulley
 Rocker spacers
 Firewall brackets
 Driveshaft?
 Frame X Brace
 Brake line fittings and protective coil wrap

Diagnostics		HRS	Subtotal
Description			
1	Diagnostics	3	\$360.00
2	Remove Top of Manifold to Determine The rest of the sensors on the back side of the engine	3	\$360.00
3	Clean Underside of Car Cobwebs and dead insects, Rat and Mouse Feces	1.5	\$180.00
4	Remove Engine Covers	0.25	\$30.00
Shop Supplies (5%): \$46.50 Tax (6.25%): \$2.91			Total: \$979.41

Custom Engine Harness				
Description	Price	QTY	HRS	Subtotal
1			58.33	\$7,000.00
2			2	\$240.00
3			15	\$1,800.00
4			5	\$600.00
5	\$1,000.00	1		\$1,000.00
6			6	\$720.00



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Invoice #3037

Created: 1/31/2023 10:57 AM CST
 Completed: 9/26/2023 03:10 PM CDT
 Invoiced: 9/27/2023 08:44 AM CDT
 Payment Term: On Receipt
 Service Writer: Todd 'Therk' Therkildsen

Shocks		2.5	\$400.00
1	R&R Both Front/Rear Shocks Note: Removed front wheels removed sway bars links to gain access to struts removed strut, during visual inspection noticed that both sway bar endlinks were blown out recommend replacement along with lower ball joint. Re installed new struts and torqued everything to spec. Removed rear wheels and sway bar links, removed trunk trim to gain access to strut tower, removed strut, during visual inspection noticed both blown out sway bars and a blown out upper and lower ball joint, installed new strut and reinstalled trunk trim torqued to spec. All wheels torqued to spec 100 ft-lbs		
2	Rear Struts	\$299.14	2 \$598.28
3	Front Left Strut	\$350.21	1 \$350.21
4	Front Right Strut	\$350.21	1 \$350.21
		Shop Supplies (6%): \$24.00	Tax (6.25%): \$81.17
		Total: \$1,803.87	

Suspension				
Description	Price	QTY	HRS	Subtotal
1 Tie Rod R&R (Outer, Both Sides) Note: Removed tie rod nut, removed outer tie rod replaced with new and re installed and torqued tie rod nut			0.6	\$96.00
2 Stabilizer Bar Links R&R (Both Sides) Note: Removed sway bar end links and installed new links, verified fitment			0.8	\$128.00
3 Suspension Control Arm R&R (Front Upper, Both Sides) Note: Removed steering knuckle removed shock removed overflow tank in engine bay to gain access to control arm hardware, removed control arm and installed new one, reinstalled shock and steering knuckle verified fitment			1.6	\$256.00
4 Steering Knuckle R&R (Both) Note: Removed lower ball joint, tie rod, upper ball joint, brakes and hub assembly, removed steering knuckle and installed new one, reinstalled upper ball joint, hub assembly, lower ball joint, tie rod, and brakes, torqued to manufacture spec verified repair			1.6	\$256.00
5 Front Right Outer Tie Rod End	\$58.00	1		\$58.00
6 Front Left Outer Tie Rod End	\$66.56	1		\$66.56
7 Sway Bar End Links	\$24.74	2		\$49.48
8 Front Left Knuckle with Lower Ball Joint	\$86.89	1		\$86.89
9 Front Right Knuckle with Lower Ball Joint	\$113.77	1		\$113.77
10 Front Right Control Arm w/ Upper Ball Joint	\$192.68	1		\$192.68
11 Front Left Control Arm w/ Upper Ball Joint	\$192.68	1		\$192.68
12 O'reilly Shipping #0402	\$10.00	1		\$10.00



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Estimate #1093

Created: 8/19/2020 03:22 PM CDT
Service Writer: Todd "Therk" Therkildsen

Authorizations

Email by Terre Williams 7/14/2021 at 1:41 PM CDT	+ Custom Engine Harness + Engine	\$36,891.70
Email by Terre Williams 11/17/2020 at 11:16 AM CST	+ Engine	\$26,881.11 +\$2,844.36
In App by Terre Williams 3/8/2021 at 11:16 AM CST	- Engine	\$24,036.75 -\$2,844.36
Phone by Terre Williams 2/2/2021 at 9:39 AM CST	+ Diagnostics + Custom Engine Harness + Engine	\$26,537.87 +\$25,794.86
In App by Terre Williams 2/2/2021 at 9:39 AM CST	- Diagnostics - Custom Engine Harness - Engine	\$743.01 -\$25,794.86
Phone by Terre Williams 1/15/2021 at 10:59 AM CST	+ Custom Rack + Remove and repair camshafts	\$21,655.87 +\$1,122.13
In Person by Terre Williams 10/28/2020 at 8:04 AM CDT	+ Diagnostics + Custom Engine Harness	\$19,844.47

Notes

9/16/2020 7:49 AM CDT

Charles Amos

To All,

Here is the information I have found so far on the Thunderbird:

2002 Ford Thunderbird
Engine: 3.9 A.J-30 Supercharged Engine (390HP/390TQ according to <https://www.caranddriver.com/news/a15136084/ford-supercharged-thunderbird-auto-shows/>)
RF-XW43-6015-DJ (No information from Ford on this engine. Last 8 digits of VIN are stamped into the block and transmission)
RM-2W4J-6006-AA (Engine listed by VIN but obviously different than the one in the car)
Transmission: 5R55N 5 speed
1W4P-AA
R.J-L (Transmission Code)
007660 (Serial Number)
BD-1D20 (Build Date April 20th 2001)

Additional Links:

[https://en.wikipedia.org/wiki/Ford_Thunderbird_\(eleventh_generation\)](https://en.wikipedia.org/wiki/Ford_Thunderbird_(eleventh_generation))
<http://www.portholeauthority.com/thenewbird/concept/super.html>
<http://www.drivingenthusiast.net/sec-ford/FMC-concepts-prototypes-showcars/thunderbird-supercharged/default.htm>
<http://www.drivingenthusiast.net/sec-blog/2010/07/19/several-recent-ford-concepts-to-be-auctioned-by-rtm/>
<http://www.drivingenthusiast.net/sec-blog/2015/10/02/thunderbird-ford-built/>
<http://www.super7thheaven.co.uk/components/jaguar-aj-v8/>
https://www.sonnax.com/tech_resources/195-figuring-out-the-5r55-alphabet
<https://shop.ukrtrans.biz/wp-content/uploads/catalogs/5R55S.pdf> (Not on the 5R55N, but on the same family of



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fire, theft, or any other cause(s) beyond our control. We are not responsible for any delays caused by unavailability of parts or delays in delivery of parts by the supplier. We will keep you informed and perform only the services/labor that you have authorized.

Vehicles older than 1999 - We are unable to foresee any additional issues with vehicles older than 1999. There may be instances where a vehicle may require additional labor time and services due to unpredictable circumstances of possible part durability and failures. We will do our due diligence to ensure that you are communicated to any issues that arise. Labor times may vary due to complications.

HD Motorsports is not responsible for installing defective customer supplied parts, or anything that may occur if part was to fail. Customers will be held liable for all labor associated with any failed parts as well as any labor associated with taking apart a vehicle and putting back together the vehicle. HD Motorsports does not warranty any work done with customer supplied parts. Customer will be billed time for any issues that may occur with failed/incorrect parts.

HD Motorsports, LLC

Signature

Past Authorizations

[Redacted] 4/11/2023 at 9:47 AM CDT	<ul style="list-style-type: none"> + Add Secondary Resonators On Exhaust + Find Source of the Rubbing + Shocks + Steering Wheel Controls + Thunderbird Mirrors + Torque Converter 	\$1,727.32
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 info@hdmstx.com
 www.hdmstx.com

Retro

Invoice #3037

Created: 1/31/2023 10:57 AM CST
 Completed: 9/26/2023 03:10 PM CDT
 Invoiced: 9/27/2023 08:44 AM CDT
 Payment Term: On Receipt
 Service Writer: Todd 'Therk' Therkildsen

3% CC Fee	
Description	Subtotal
1 3% CC Fee 4/28	\$105.18
2 3% CC Fee 7/12	\$23.25
3 3% CC Fee 9/26	\$77.88
Total: \$206.31	

Thank you for your business. The work is complete, and your payment is due upon pickup of the vehicle. Please contact us promptly if you have any questions, comments or concerns. We would appreciate any feedback that may help us better serve you and all of our customers.

Mechanic liens may be placed on vehicles until the balance for services is paid in full. Additional storage fees may be applied up to \$50 a day to abandoned vehicles or vehicles that are left for more than 2 days after services are completed if customers have not made prior arrangements with HD Motorsports Management.

Thank you
 The Staff at HD Motorsports

Signature _____

Totals only include authorized services.

Parts	\$2,775.22
Labor	\$2,196.00
Subcontract	\$1,635.53
Subtotal	\$6,813.06
Shop Supplies	\$131.76
Fees	\$206.31
Tax	\$172.83
Grand Total	\$7,117.65
Paid To Date	(\$4,409.84)

REMAINING BALANCE \$2,707.81

*Chk # 911
636*

Payments			
7/12/2023	Other	Swipe Simple #10751059-1454	\$798.16
4/28/2023	Other	Swipe Simple #10658875-9341	\$3,611.68

Past Authorizations			
In App by Ramon Martinez 9/27/2023 at 1:57 PM CDT	+ Engine		\$7,117.65 + \$223.78
In App by Todd 'Therk' Therkildsen 9/27/2023 at 1:57 PM CDT	- Engine		\$6,944.75 - \$223.78
In App by Ramon Martinez 9/26/2023 at 3:06 PM CDT	+ 3% CC Fee		\$7,083.73 + \$206.31
In App by Ramon Martinez 9/26/2023 at 3:06 PM CDT	- 3% CC Fee		\$6,877.42 - \$206.31
In App by Ramon Martinez 9/26/2023 at 1:39 PM CDT	+ Thunderbird Mirrors		\$7,005.85 + \$1,208.72
In App by Ramon Martinez	- Thunderbird Mirrors		\$5,881.93



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Created: 8/19/2020 03:22 PM CDT
 Service Writer: Todd "Therk" Therkildsen

8/19/2021 10:23 PM CDT

Reply directly in this email thread or reply online

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Needs Response

Power steering				
Description	Price	QTY	Subtotal	
1 ATF/Power steering fluid	\$8.38	4	\$33.52	
Tax (6.25%)			\$2.10	Total: \$35.62

Wheels and Alignments				
Description		HRS	Subtotal	
1 Balance all wheels		1	\$130.00	
2 Alignment		2	\$260.00	
Shop Supplies (5%)			\$19.50	Tax (6.25%) \$1.22
			Total: \$410.72	

Final assembly				
Description	Price	QTY	HRS	Subtotal
1 Install interior panels			4	\$520.00
2 Terminate harness in trunk <i>Note. During trunk interior panel install found harness with exposed wires, terminated wire ends and secured harness.</i>			0.5	\$65.00
3 Install trunk interior panels			2	\$260.00
4 Final exterior panel assm <i>Note. In the process of the final edit. Adding some of the exterior panels. Checking that all components have proper operation. Communicating with Chuck and possible Jon to finish wiring in supercharger coolant pump. Supercharger coolant pump is to be triggered by the Link ECU. A fuel pressure sensor should be added. The Link ECU harnesses has a provision for one and the Link ECU</i>			4	\$520.00



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Charles Amos

11/2/2020 11:11 AM CST

Here is information on the transmission shift strategy.

<https://at-manuals.com/manuals/5r55w-s-t/>

Charles Amos

11/4/2020 7:56 AM CST

Here is a list of Thunderbird PCMs that lists the 2004 computer (4W6A-12A650-UB) that came with the vehicle. Also, there is an '04 symbol written on the PCM as seen in this picture.



Charles Amos

11/4/2020 8:06 AM CST

Sorry here is the website <https://forums.fordthunderbirdforum.com/threads/2002-2003-2004-2005-ford-thunderbird-3-9l-pcm-ecm-ecu.9792/>

Charles Amos

11/4/2020 8:23 AM CST

Here's an update on the Thunderbird so far.

- We have the engine and transmission out of the car with full access to the wiring harness, which was necessary given the way the supercharger was assembled.
- We have what we are assuming is the original PCM (it was unplugged and in the passenger seat of the Thunderbird) and a 2004 Thunderbird PCM (it was in an envelope in the trunk).
- There does not appear to be any aftermarket support for the stock transmission (5R55N) in terms of a standalone controller.
- The 03-05 Thunderbird does have aftermarket support for tuning through HPTuners, but the transmission was also changed in 2003 from the 5R55N to the 5R55S (we are still determining the extent of the differences between these transmissions).

We have a couple of solutions that we are currently exploring:

- Solution 1: Use the 2004 Thunderbird PCM to run the engine and transmission.
- Solution 2: Use an aftermarket ECU to run the engine, and provide enough information to the stock PCM to run the transmission.

Both solutions would require a custom harness.



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2002 Ford Thunderbird Base (Silver)
VIN: 1FAHP60A82Y100397

Recommendations

Engine R+I taking longer than expected due to unique nature of the engine and complexity of components. Extensive documentation (photos) of the process is available. Recommend adding additional hours to Engine R+I task.

Supercharged 2004 Ford Concept Vehicle

Customer needs to decide if the vehicle needs to pass emissions for vehicle registration. If so, the extent of testing and development will be much more than the case where it does not need to pass emission. It is recommended in any case that the engine and transmission be run on a test stand (to be built) to ensure the engine and transmission run well before installation into vehicle. A custom extension cable may be built to communicate with the body harness to check gauges and functionality.

(Listed in order of increasing complexity, parts required, and modifications)

Option 1: Use the stock PCM (No tuning capabilities). Fix/replace harness and ensure all sensors are plugged in and working properly. Can read engine codes for faults. May be able to use externally-monitored wideband O2 sensors and externally-monitored knock sensors to check the efficacy of the stock PCM for supercharged application. Will not be able to tune engine or transmission for driveability. Can only run as good as it ran originally.

Option 2: If stock PCM cannot run engine effectively, it may be piggybacked with an aftermarket PCM compatible with camshaft and crankshaft sensors of engine. Would give tuning capabilities to the engine, but no way of anticipating the stock PCM's reaction to having subsystems taken out of its control. For example, aftermarket PCM takes over ignition and fuel, but the stock PCM kick a CEL that puts the transmission into limp mode that we cannot clear because we cannot write to the stock PCM. Could require extensive testing to ensure dual-PCM compatibility. Harness options range anywhere between repair, patching, and full custom harness. May build capabilities into the harness to expand into option 3 in the event there are problems using stock PCM. Still no way to edit shift points or line pressure or any other transmission parameters that would ensure driveability.

Option 3: Use aftermarket PCM and different transmission. May have fitment issues, but would have full tuning capabilities and can therefore guarantee driveability. AJ V8 in 4.0 supercharged XK8/XKR used W5A580 Mercedes transmission (same as Chrysler NAG-1), which does have aftermarket support. This option would allow for full tuning of engine and transmission, but with substantial modification to the vehicle for fitment and substantial tuning and wiring hours. Still need to confirm bellhousing compatibility. Would guarantee the vehicle would pass emissions and be able to be registered for road use. If we use this option, we have contact with Russell Drake at Sound German Automotive. He is the leading expert at running aftermarket TCM with Chrysler NAG-1/WA580 transmission.

To-Do:

- Does not need to pass emissions
- PCM cost
- Full Custom Harness with dual signal wires for aftermarket and stock PCM. May also include option to expand into aftermarket TCM and a different transmission.
- Engine test stand fabrication
- BCM Extension cable to interface with the vehicle
- Troubleshooting dual-PCM issues
- Tuning
- Replacement of rusty parts*