



MOONEY AIRPLANE COMPANY, INC.

August 23, 2007

Attn.: Aircraft Owners/Mooney Service Centers

We have verified two (2) of the Mooney Service Centers aforementioned in the M20-298 Service Bulletin do Not have the Garmin Clutch Fixture at thier facility.

1. Lone Star Aero - Does Not have the fixture at this time.
2. Virginia Aviation - Does Not have the fixture at this time.

We have added these Service Centers who have the fixture:

Recommended - Mooney Service Centers (USA)

<u>Company Name</u>	<u>City</u>	<u>Telephone #</u>
1. Premier Aircraft Sales and Service	Ft. Lauderdale, Florida	800-903-8402
2. Crown Air Aviation	San Diego, California	888-276-9624

Mooney Airplane Company, Inc.
165 Al Mooney Road
Kerrville, Texas 78028
830-896-6000



THIS BULLETIN IS FAA APPROVED FOR ENGINEERING DESIGN

SERVICE BULLETIN M20-298A

Date: September 17, 2007

SUBJECT: Aircraft with GARMIN GFC700 - Enable the Manual Electric Trim Function.**MODELS/ SN AFFECTED:** Step (1): (Only required if complied with Service Bulletin M20-295 - Disabling the Manual Electric Trim function)**M20M:** 27-0318, 27-0326 thru 27-0355**M20R:** 29-0333 thru 29-TBA**M20TN:** 31-0001 thru 31-TBA**MODELS/ SN AFFECTED:** Step (2 & 3) : (All Aircraft with GARMIN GFC700 Installed)**M20M:** 27-0318, 27-0326 thru 27-0355**M20R:** 29-0333 thru 29-TBA**M20TN:** 31-0001 thru 31-TBA**TIME OF COMPLIANCE:** At Owner's Discretion**INTRODUCTION:** This Service Bulletin will enable the GARMIN GFC700 manual electric trim to function properly after this Service Bulletin is complied with. This Service Bulletin has been written in three (3) procedure steps. Work must be completed by a GARMIN Authorized Service Center who can perform the work due to "Special Tools" required to comply with this Service Bulletin. Listed below are recommended Mooney Service Centers: (with in-house GARMIN clutch fixture)**Recommended - Mooney Service Centers (USA)**

Company Name	City	Telephone #
1. Arapahoe Aero Avionics, Inc	Englewood, CO	303-799-6289
2. Avionics of Modern Aero, Inc.	Eden Prairie, MN	952-941-2595
3. C & W Aero Services, Inc.	West Caldwell, NJ	973-227-5750
4. Daytona Aircraft Service, Inc.	Daytona Beach, FL	386-255-2049
5. Epps Aviation	Atlanta, GA	770-458-9851
6. Executive Beechcraft, Inc.	Kansas City, MO	816-842-8484
7. Hagerstown Aviation Services, Inc.	Hagerstown, MD	301-733-5200
8. Lone Star Aero, SAMPM, Inc.	San Antonio, TX	210-979-6313
9. Mooney Factory Service Center	Kerrville, TX	830-792-2924
10. Muncie Aviation Company	Muncie, IN	765-289-7141
11. Virginia Aviation	Lynchburg, VA	434-237-8434

Recommended - Mooney Service Center (Foreign)

Company Name	City	Telephone #
12. SA Mooney Sales and Service CC	Port Alfred, 6170 South Africa	27-46-624-5332

INSTRUCTIONS: Read entire procedures before beginning work.**STEP 1:** This Procedure will re-connect all wires that were disconnected if complied with Service Bulletin M20-295. **NOTE: If Aircraft has not complied with Service Bulletin M20-295, proceed to step 2 procedure of this service bulletin.****STEP 2:** This procedure will replace the sprocket and modify chain as per instructed in this procedure.**STEP 3:** This procedure will explain how to download and upgrade the GARMIN GFC700 software as per instructed in this procedure.

STEP (1) - Enable the Manual Electric Trim:

- 1-1. Turn master switch - OFF.
- 1-2. Locate AMP connector with specified wires at end of the Pilot's Control Wheel tube, verify if factory installed or retrofit installed (refer to Figure M20-298-1) also refer to Chapter 39-10-04 of applicable MAC aircraft Service & Maintenance Manual.

NOTE:

The harness installation may require cable ties to be removed for adequate clearance to remove PVC Tubing or (heat shrink tubing if installed) and insert wire terminals into connector.

- 1-3. Insert wire pins with into AMP Connector on the Pilot's Control Wheel harness (refer to Figure M20-298-1 and M20-298-2) also refer to Chapter 39-10-04 of applicable MAC aircraft Service & Maintenance Manual.
- 1-4. Install any cable ties to secure harness if removed for access.
- 1-5. Remove placard (150056-(X)3048(Y)) on instrument panel (refer to Figure M20-298-3).

STEP (2) - Install new GFC700 Sprocket and Modify Chain Assembly:

- 2-1. Remove LH and RH Tailcone access panels, and locate GFC700 Servo Mount.
- 2-2. Loosen servo bracket (4) mounting bolts to release chain tension and remove chain from servo. A master link on the chain will allow chain to be removed from Aircraft (refer to Figure M20-298-4).
- 2-3. Cut and remove safety wire and (6) mounting screws from end cap to remove sprocket (refer to Figure M20-298-4).
- 2-4. Remove the (2) mounting bolts from Servo and move away from back of Servo Mount. Remove Servo Mount (4) attaching bolts and remove from Aircraft (refer to Figure M20-298-5).

-CAUTION-

USE CARE WHEN REMOVING SERVO MOUNT FROM AIRCRAFT NOT TO ALLOW ANY FOREIGN OBJECT DEBRIS TO ENTER SERVO MOUNT ORIFICES (CLUTCH ASSY).

NOTE:

REFER TO INSTALLATION STANDARD PRACTICES, GARMIN DOCUMENT 001-00029-00 FOR ALL FASTENER TORQUES EXCEPT AS NOTED.

- 2-5. Place the servo onto a GARMIN clutch setting stand 011-01085-XX & secure with toggle clamps. Install the chain supplied with the stand between the capstan under test & the fixture capstan. Remove the slack in the chain with tension adjustment knob. Tighten the thumbscrews on the fixture capstan (refer to Figure M20-298-6 & 7).
- 2-6. Attach a socket to a calibrated torque wrench of appropriate range (150 In.lbs.) & place the assembly on top of the fixture capstan. The torque wrench handle should go through the wrench support fixture of the stand. Adjust the wrench support fixture so that it contacts the handle of the torque wrench in the appropriate location (refer to Figure M20-298-7).
- 2-7. Connect a 24 Volt DC power supply to the test stand.
- 2-8. Place the solenoid switch to ON & run motor CW. Adjust the capstan nut until torque value indicates the required setting (84 ± 10 in. lbs). Switch direction to CCW and adjust capstan nut until the torque value is within required range (84 ± 10 in. lbs).
- 2-9. Switch motor back and forth adjusting capstan nut as needed until required torque range is achieved in both directions. Move the nut to align with the holes in the capstan shaft, to allow for cotter pin installation.
- 2-10. Observe the torque reading for at least two revolutions each direction. Ensure that minimum and maximum torque readings are within the tolerance specified above. When finished, remove the servo mount from the test stand. Install a cotter pin (P/N MS24665-283) in the servo mount capstan shaft. For further information refer to 190-00303-72 GARMIN Installation Manual.

-CAUTION-

USE CARE WHEN HANDLING SERVO MOUNT NOT TO ALLOW ANY FOREIGN OBJECT DEBRIS TO ENTER SERVO MOUNT ORIFICES (CLUTCH ASSY).

- 2-11. Install servo mount in aircraft pitch trim bracket with original (4) bolts. Torque to 35 ± 5 in. lbs.
- 2-12. Install servo to servo mount with original (2) bolts. Torque to 35 ± 5 in. lbs.
- 2-13. Install new sprocket (P/N 830152-5) and dust cap assembly, secure with original (6) attaching screws. Check for alignment (top and bottom) sprockets (refer to Figure M20-298-4).
- 2-14. Install Safety wire (P/N MS20995-C) through attaching screws, refer to AC 43.13-1B CH 7 Section 7.
- 2-15. Before installing chain you must cut and remove 11 links (to make 96 rollers and 1 master link) from chain.
- 2-16. Chain installation procedure:
 - a.) Set elevators to neutral position. Set elevator trim to takeoff.
 - b.) Loosen servo mount bracket (4) bolts (refer to Figure M20-298-4).
 - c.) Route chain and install master link (P/N 25SS CL), align so there is no binding against sprocket and chain (refer to Figure M20-298-4).
 - d.) Using servo mount bracket (slide up or down) set chain tension such that a 1-2 lb force causes deflection of $1/8$ ". To be measured at the point of longest span, turn the sprocket around full rotation during deflection check to make sure all slack has been eliminated. Torque bolts to 35 ± 5 in. lbs.
 - e.) Manually run elevator trim through range of motion ensuring correct position and movement of chain on sprocket and trim indicator.
- 2-17. Install LH and RH Tailcone access panels.
- 2-18. Turn master switch - ON.
- 2-19. Check and verify control system for free "non-binding" movement.

Step (3) - Extract and Install GARMIN GFC700 Software:

NOTE:

The Service Center performing the work must extract the new software version (006-B0401-22) from the Mooney Airplane Company - WebPortal) to a compatible Loader Card for Software Installation.

- 3-1. After all work has been completed, Installation of new GARMIN configuration software (Version 006-B0401-22) will be required. refer to Software Installation Instructions attached in this procedure.
- 3-2. Perform all checks listed in this Service Bulletin refer to section Checks and Testing.
- 3-3. Test Manual Electric Trim; run Manual Electric Trim through range of motion ensuring correct upward and downward position of Trim Indicator.
- 3-4. Perform a Post Maintenance Check Flight per GFC700 Flight Manual Supplement to check proper operation of the Manual Electric Trim system (refer to the M20M, M20R, M20TN aircraft POH/AFM Supplement "GARMIN GFC 700 AUTOMATIC FLIGHT CONTROL SYSTEM AND TAWS OPTION").
- 3-5. Complete log book entry for procedure.
- 3-6. Return aircraft to service.
- 3-7. Procedure complete.

WARRANTY: Mooney Airplane Company, Inc. will warrant labor (approximately 4.5 hours), when done in accordance with the procedures of this Service Bulletin for aircraft currently covered under the Mooney Airplane Company, Inc. factory warranty program.

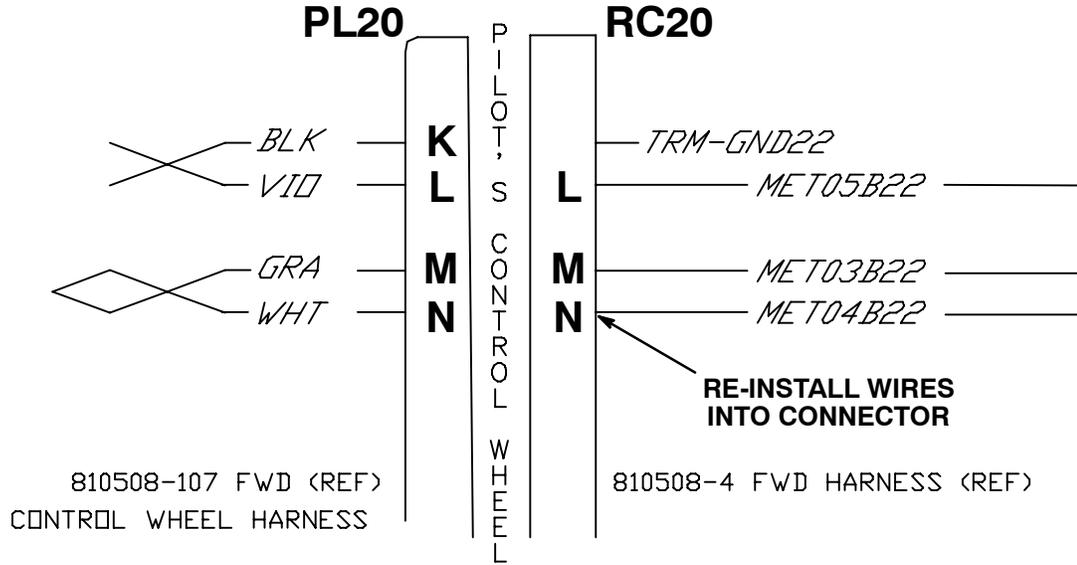
REFERENCE DATA: MAC Service & Maintenance Manuals (applicable A/C), Service Bulletin M20-295, GARMIN Installation Manuals

PARTS LIST: Mooney Airplane Company, Inc., Parts Kit: M20-298-001

<u>Item</u>	<u>P/N</u>	<u>Description</u>	<u>Qty</u>
1.	T50R9M4	Cable Ties	6
2.	830152-5	Sprocket (54 Tooth)	1
3.	25SS-CL	Chain Master Link	1
4.	MS20995-C	Safety Wire	12"
5.	MS24665-283	Cotter Pin	1

<u>SPECIAL TOOLS:</u>	<u>P/N (If Applicable)</u>	<u>Description</u>
	006-B0401-22	GARMIN Software Revision (Rev 22) (Download file) http://factoryparts.mooney.com
	TE12A	TORQOMETER, U.S., Basic, 150 in. lb., 3/8" drive (SNAP ON TOOL COMPANY)
	T010-00110-01	GARMIN CLUTCH SETTING STAND W/TEST CHAIN AND SPROCKET (24V POWER SUPPLY)
	380-00015-20	TEST SPROCKET (GARMIN P/N ONLY)

(Factory Installed GFC700 - Color Coded Trim Switch Harness)



(Retrofit Installed GFC700 - Wire Numbered Trim Switch Harness)

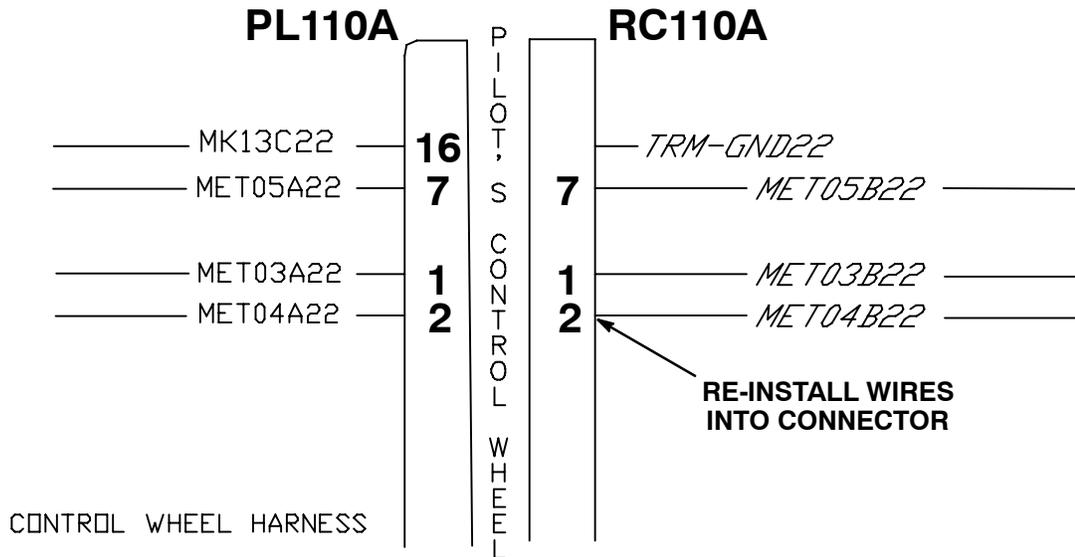


Figure SB M20-298-1 - Re-Install Control Wheel Harness Wires to Connector

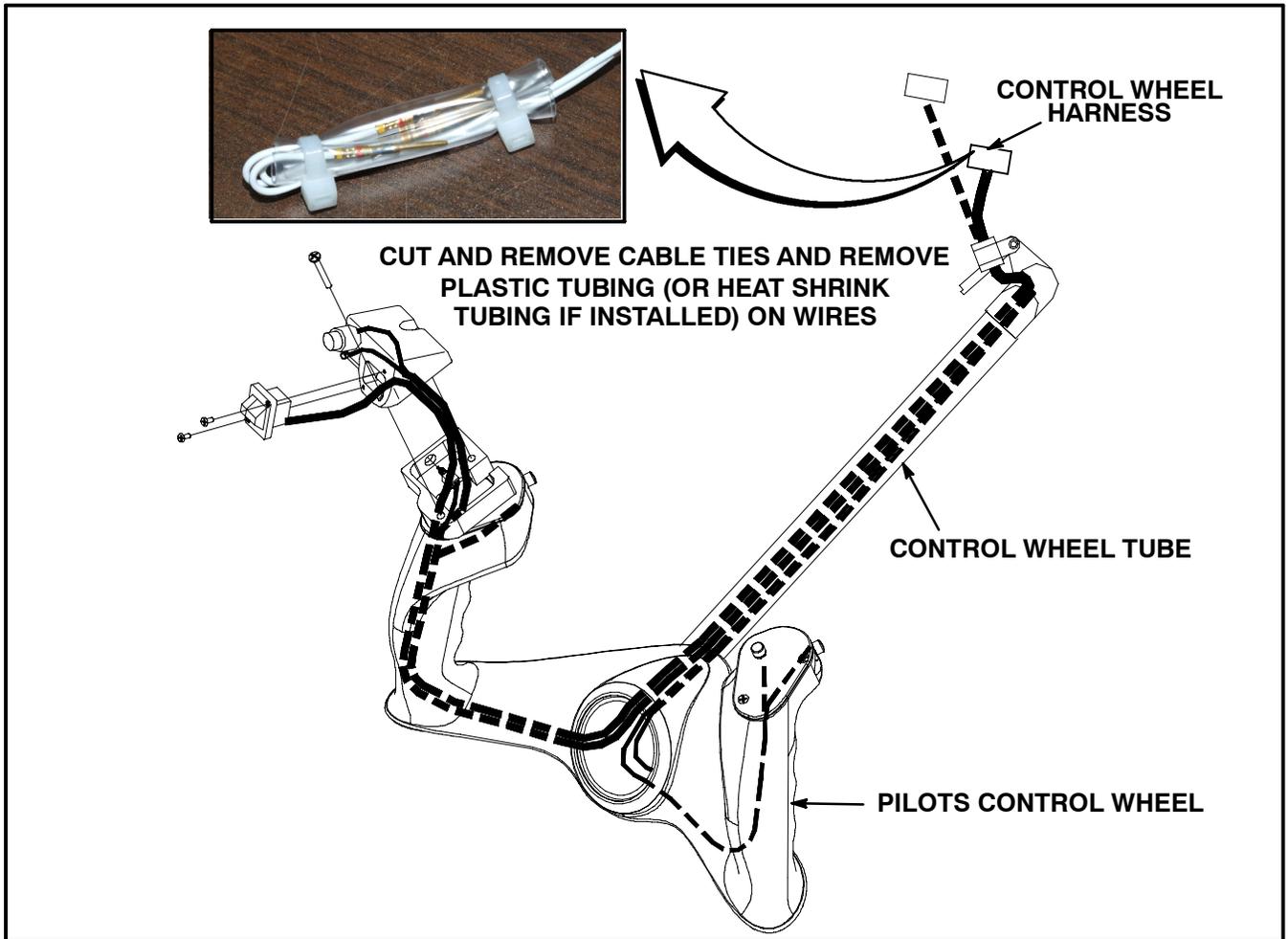


Figure SB M20-298-2 - Control Wheel Harness

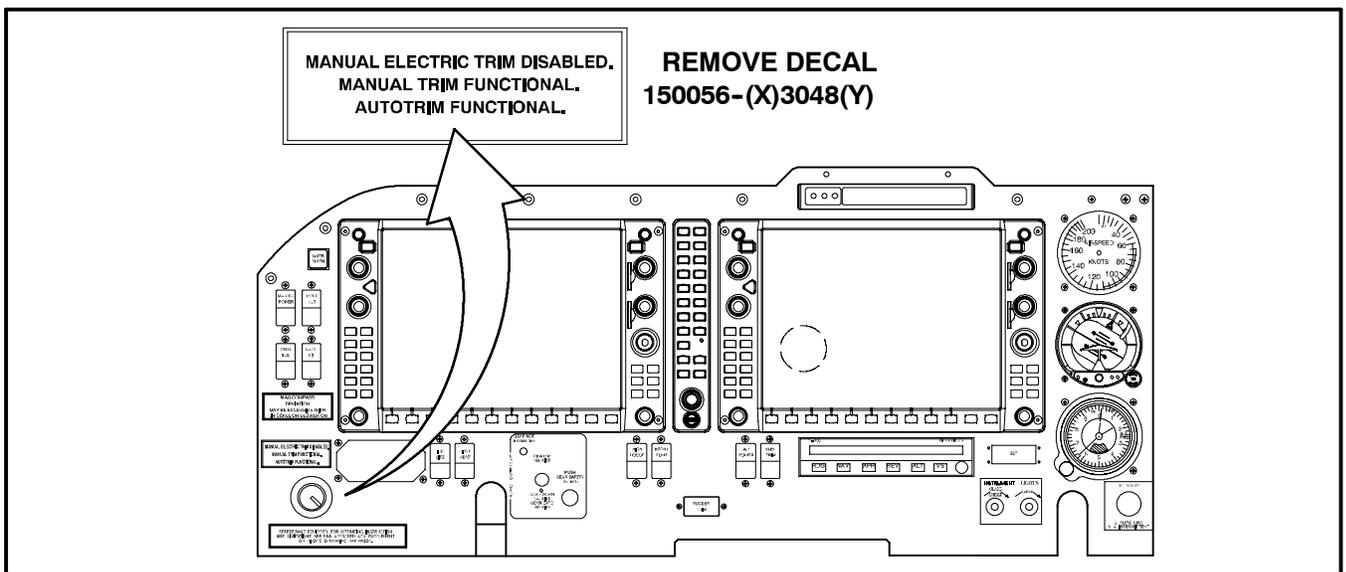


Figure SB M20-298-3 - Remove Placard

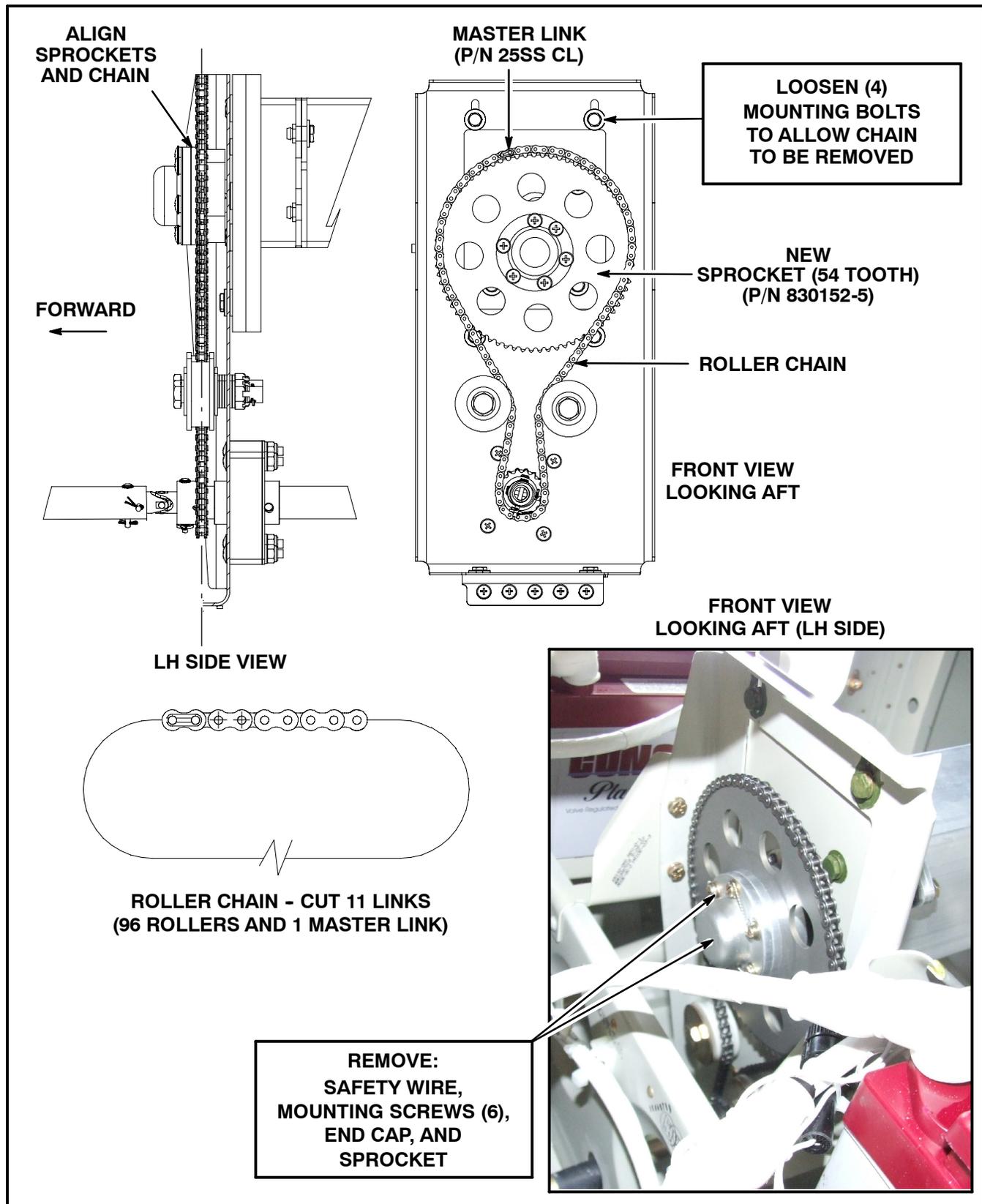
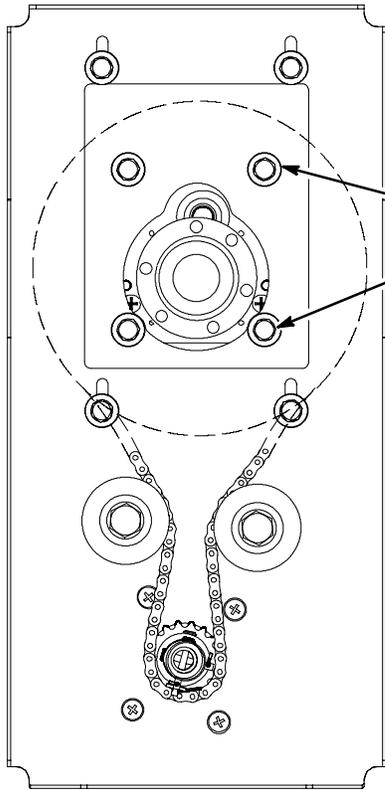


Figure SB M20-298-4 - Removing Sprocket from Servo and Servo Mount



**FRONT VIEW
LOOKING AFT
(SHOWN WITH SPROCKET REMOVED)**

**REMOVE:
MOUNTING
BOLTS (4)
TO
SERVO MOUNT**

SERVO MOUNT



**REMOVE SERVO
MOUNTING
BOLTS (2)**

VIEW FROM AFT RH SIDE LOOKING FORWARD

Figure SB M20-298-5 - Remove Servo Mount

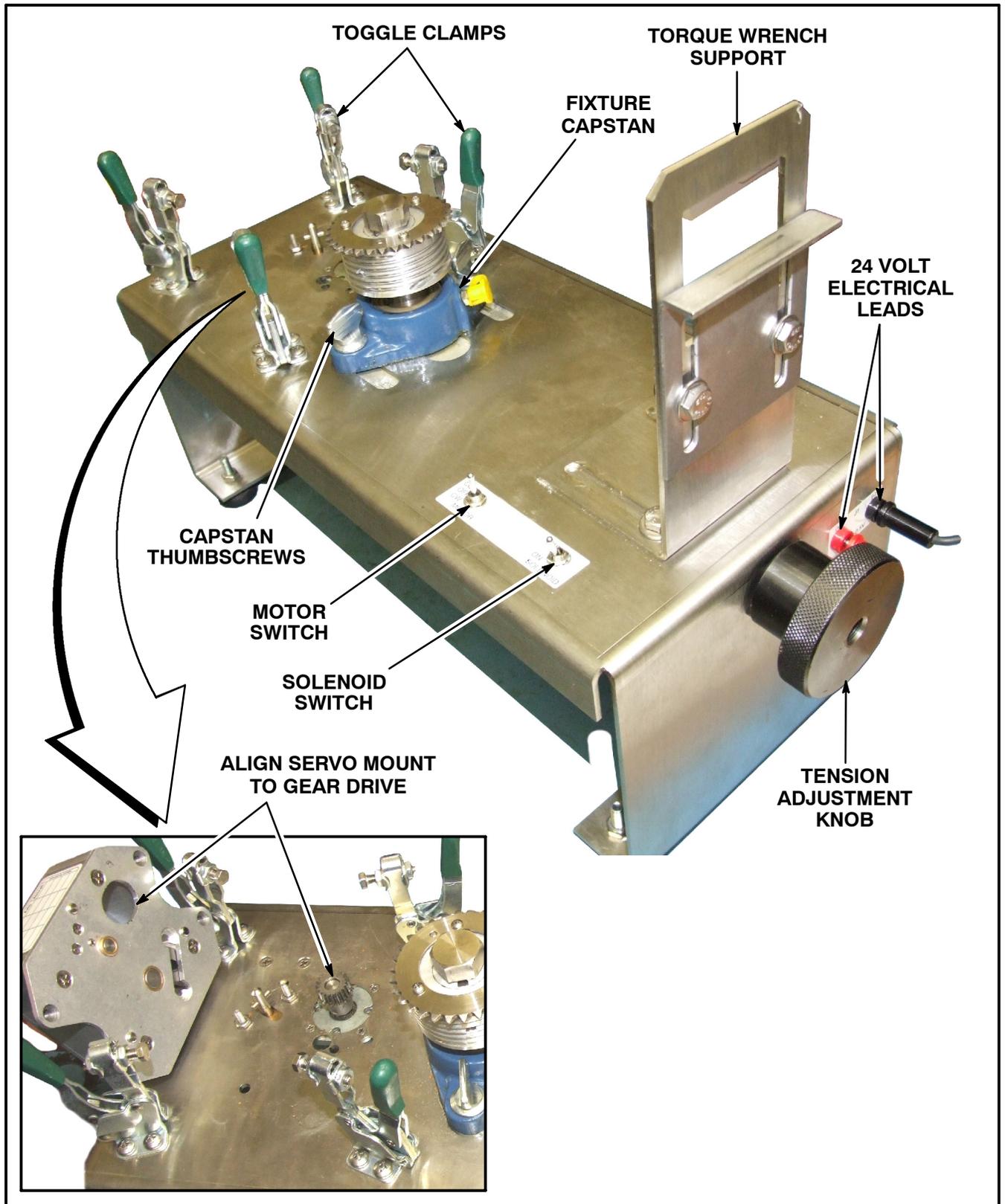


Figure SB M20-298-6 - Servo Mount Test Stand (GARMIN Manufactured)

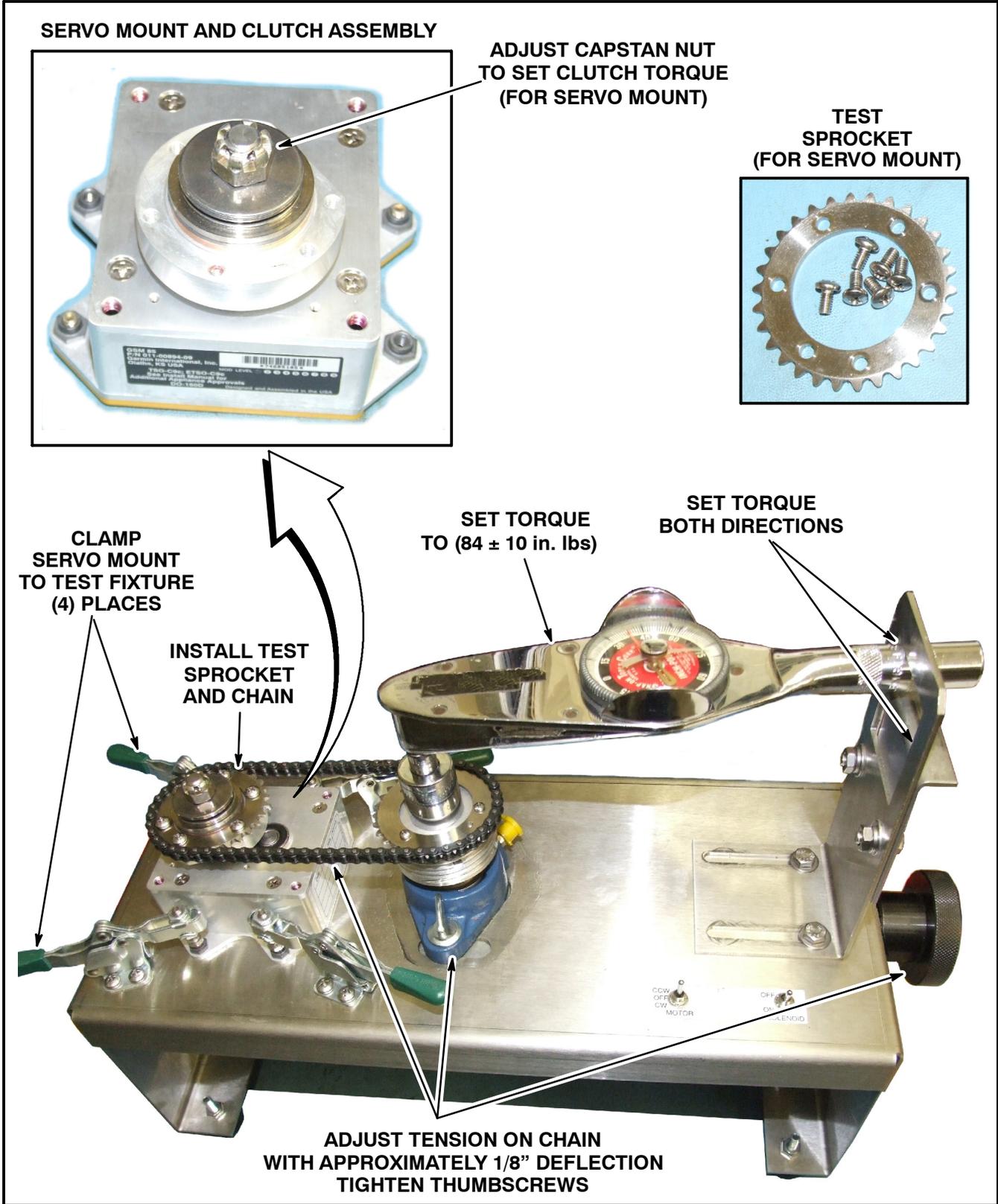


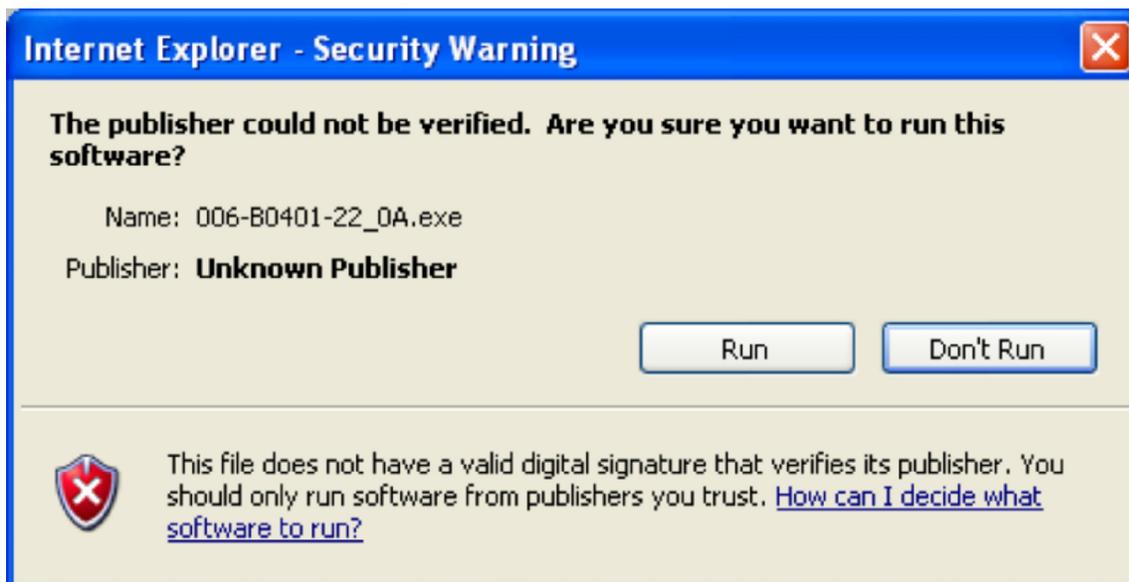
Figure SB M20-298-7 - Servo Mount Clutch Adjustment

Extracting the revised GARMIN Software (from MAC - WebPortal):

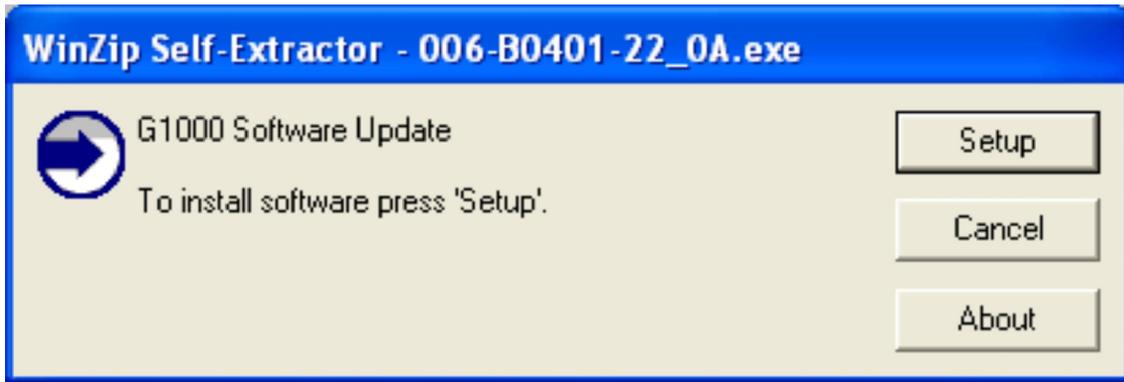
1. Login to the Mooney Airplane Company WebPortal (must have username and password)
2. Select on the link <http://manuals.mooney.com>. This link will open the technical publication front page.
3. Insert your SD Loader Card into the Card Reader.
4. Select on the link **GFC700 Software Revision (006-B0410-22)**. A pop-up screen will prompt you to “Run” or “Save” the file. Select “Run” to acknowledge the following prompt:



5. Some servers have Security Warnings, Select “Run” to acknowledge the following prompt:



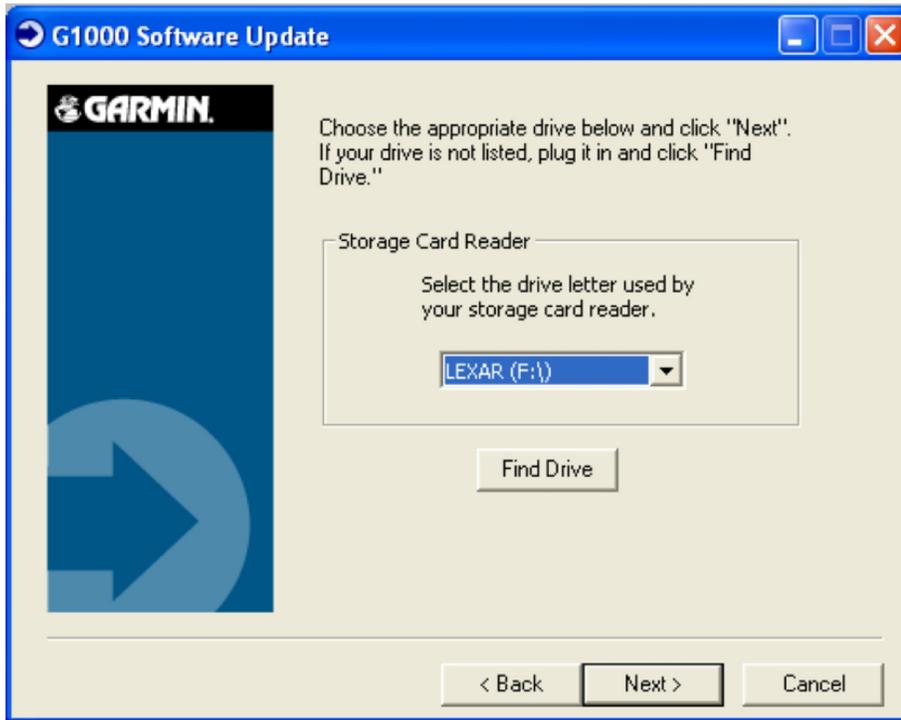
6. To extract the required files, select “**SetUp**” to acknowledge the following prompt:



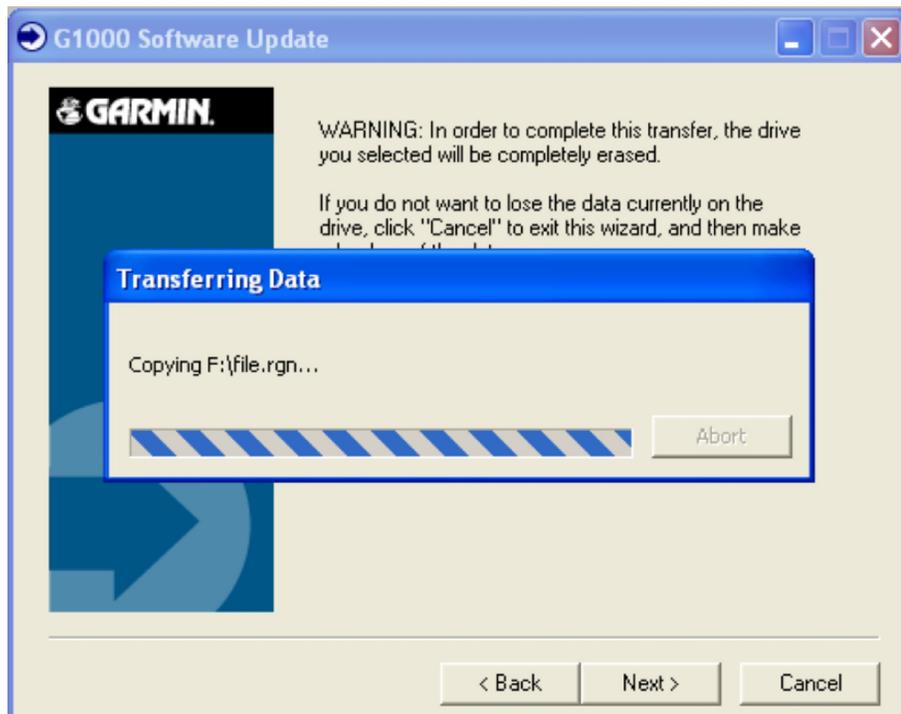
7. The Software screen will show the Aircraft M20 and latest software revision, select “**Next**” to acknowledge the following prompt:



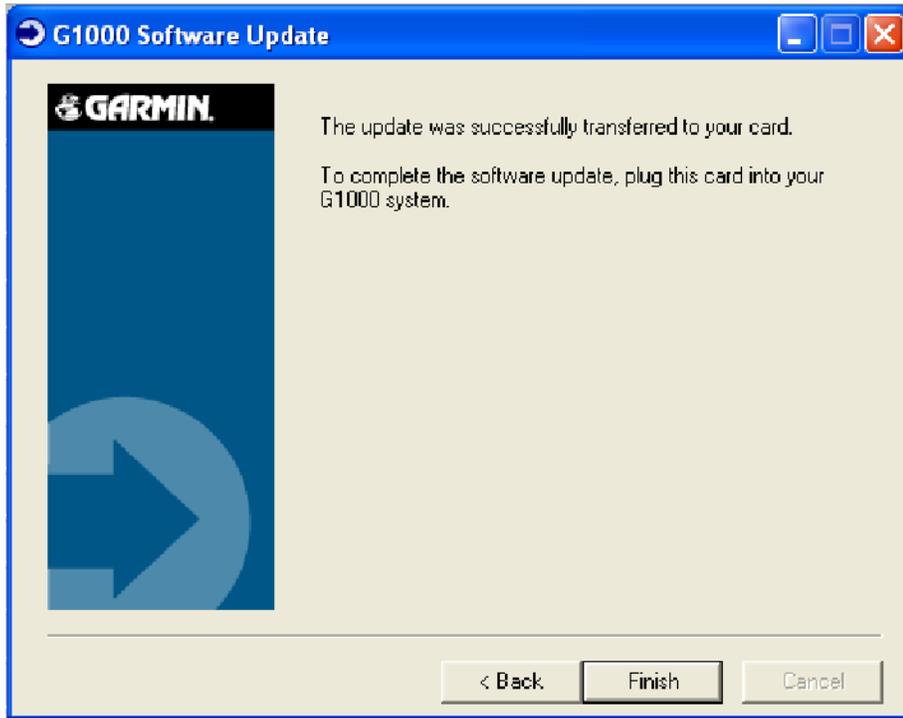
8. Verify the Drive letter where the SD Card reader is plugged in, select “Next” to acknowledge the following prompt:



9. Files will now extract to SD Card, monitor the download process:



10. When the download is complete, select “**Finish**” to acknowledge the following prompt:



11. When complete the SD Loader Card can now be ready for Software Installation to the Aircraft G1000 PFD/MFD.

SOFTWARE INSTALLATION INSTRUCTIONS: (VERSION 006-B0401-22)

NOTE:

The Service Center performing the work must extract the new software version (006-B0401-22) from the Mooney Aiplane Company - WebPortal) to a compatible Loader Card for Software Installation.

S1.0 System Power Up - Apply power to the G1000 by doing the following:

- a.) Connect a ground power unit to the external power receptacle, and turn on the ground power unit.
- b.) Pull **Terrain/Obstacle Database Cards** from lower slots in both PFD/MFD (if installed).
- c.) Turn on the **MASTER** switch. Turn on the **A/P POWER** switch. At this moment, all G1000 equipment is receiving power.

S1.1 MFD & PFD Software Load:

- a.) Pull the MFD and PFD circuit breakers.
- b.) Insert the correct **Loader Card** into the MFD top card slot.
- c.) While holding the **ENT** key on the MFD, restore power by closing the MFD circuit breaker.
- d.) When the words "INITIALIZING SYSTEM" appear in the upper left corner of the MFD, release the **ENT** key.
- e.) Press the **ENT** key to acknowledge the "UPDATE SYSTEM FILES" prompt.

NOTE:

A softkey labeled 'YES' appears in the lower right corner and may be used in lieu of the ENT key

- f.) The "UPDATING SYSTEM FILES. PLEASE WAIT" screen will be displayed.
- g.) New software is loaded to the MFD. When complete, the MFD starts in configuration mode.
- h.) When complete, power down the MFD.
- i.) Remove the **Loader Card** from the MFD, and re-start in configuration mode.
- j.) Insert **Loader Card** into the top card slot on the PFD. Repeat Steps 3 through 6 for the PFD.
- k.) When PFD update is complete, it starts in the configuration mode. Do not remove power.

- IMPORTANT -

For the rest of the software/configuration procedure, do not operate the MFD while loading software or configuration files unless specifically instructed to do so. A failed or cancelled load may result.

S1.2 Initial G1000 Configuration:

- a.) Go to the "**Configuration Upload page**" on the PFD using the **FMS** knob.
- b.) Activate cursor and rotate the **FMS** knob once to activate the **FILE** menu.
- c.) Select Aircraft model "**(M20M, M20R, M20TN) - Base Configuration**" and press **ENT**.
- d.) Use the **FMS** knob to highlight "**AIRFRAME**" in the SECTION field.
- e.) Press the **LOAD** softkey.
- f.) Select **YES** and press the **ENT** key to acknowledge the "START CONFIGURATION UPLOAD" prompt.
- g.) Monitor the status of the upload. When the upload is finished, press the **ENT** key to acknowledge the "UPLOAD COMPLETE" confirmation:
- h.) Highlight "**SYSTEM**" in the SECTION field and repeat steps 5 through 7.
- i.) Highlight "**MANIFEST**" in the SECTION field and repeat steps 5 through 7.
- j.) Highlight "**MFD1**" in the SECTION field and repeat steps 5 through 7.

- k.) Highlight “**PFD1**” in the SECTION field and repeat steps 5 through 7.
- l.) View the SUMMARY field and ensure that all items are “COMPLETE”, then de-activate the cursor:

S1.3 GIA System Software Load: (GIA1 & GIA2)

- a.) On the **PFD**, go to the **Software Upload page** using the **FMS** knob.
- b.) Activate the cursor and select the **GIA** software file. Verify that **GIA1** and **GIA2** appear in the LRU field.
- c.) Press the **LRU** softkey.

GIA1:

- d.) Verify that **GIA1** is highlighted in the **LRU** field, and press the **LOAD** softkey.
- e.) Select **OK** and press the **ENT** key to acknowledge the “BEGIN FILE UPLOAD” prompt.
- f.) The software for **GIA1** begins to load. Monitor the upload status as it progresses.
- g.) After the files finish loading, press **ENT** to acknowledge the “UPLOAD COMPLETE” prompt.

GIA2:

- h.) Use **FMS** knob to highlight **GIA2** in the **LRU** field, and press the **LOAD** softkey.
- i.) Select **OK** and press the **ENT** key to acknowledge the “BEGIN FILE UPLOAD” prompt.
- j.) The software for **GIA1** begins to load. Monitor the upload status as it progresses.
- k.) After the files finish loading, press **ENT** to acknowledge the “UPLOAD COMPLETE” prompt.
- l.) Check the SUMMARY field to ensure the load is “COMPLETE”.
- m.) De-activate the cursor.

S1.4 GPS Software Load Procedure:

- a.) Select the **GPS** software file. Ensure that **GPS1** and **GPS2** appear in the LRU field.
- b.) Press the **LOAD** softkey.
- c.) Select **OK** and press the **ENT** key to acknowledge the “BEGIN FILE UPLOAD” prompt.
- d.) The software for **GPS1** begins to load. **GPS2** software loads immediately after **GPS1** software finishes loading. Monitor the upload status as it progresses.
- e.) After the files finish loading, press **ENT** to acknowledge the “UPLOAD COMPLETE” prompt.
- f.) Check the SUMMARY field to ensure the load is “COMPLETE”.

S1.5 Audio Region File Load Procedure:

- a.) Select the **GIA AUDIO** software file. Ensure that **GIA1** and **GIA2** appear in the LRU field.
- b.) Press the **LOAD** softkey.
- c.) Select **OK** and press the **ENT** key to acknowledge the “BEGIN FILE UPLOAD” prompt.
- d.) The software for the **GIA1 Audio Region** begins to load. **GIA2 Audio Region** software loads immediately after **GIA1** software finishes loading. Monitor the upload status as it progresses.
- e.) After the files finish loading, press **ENT** to acknowledge the “UPLOAD COMPLETE” prompt.
- f.) Check the SUMMARY field to ensure the load is “COMPLETE”.

S1.6 Clear GIA Non-Volatile Memory:

- a.) Go to the **GIA** page group and then the **RS-232/ARINC 429 CONFIG** page using the **FMS** knob.
- b.) Activate the cursor and rotate the **FMS** knob once to activate the **SELECT UNIT** menu. Select **GIA 1** and press **ENT**.
- c.) Press the **CLR NV** softkey. A confirmation pop-up message will appear. Select **OK** to clear non-volatile memory and press **ENT**.

- d.) Repeat Steps 2 and 3 for **GIA 2**.

S1.7 . . . GIA Configuration: (GIA1 & GIA2)

- a.) Go to the Configuration Upload page using the **FMS** knob.
- b.) Activate cursor and rotate the **FMS** knob once to activate the **FILE** menu.
- c.) Select Aircraft model “**(M20M, M20R, M20TN) - Base Configuration**” and press **ENT**.
- d.) Activate the cursor and highlight **GIA1** in the SECTION field.
- e.) Press the **LOAD** softkey.
- f.) Select **YES** and press **ENT** to acknowledge the “START CONFIGURATION UPLOAD” prompt.
- g.) Monitor the status of the upload. When the upload is finished, press the **ENT** key to acknowledge the “UPLOAD COMPLETE” confirmation.
- h.) Highlight **GIA2** in the SECTION field and repeat Steps 5 through 7.
- i.) View the SUMMARY field and ensure that all items are “COMPLETE”.
- j.) De-activate the cursor.

S1.8 . . . Final LRU Software Load:

- a.) Go to the Software Upload page using the **FMS** knob.

S1.9 . . . GMA 1347 Audio Panel Software

- a.) Highlight the **GMA** software file. Ensure that both paths to the **GMA** through **GIA1** and **GIA2** appear in the LRU field.
- b.) Press the **LRU** softkey. Select the **GMA1 - GIA1** data path to load software. Press the **LOAD** softkey.
- c.) Select **OK** and press the **ENT** key to acknowledge the “BEGIN FILE UPLOAD” prompt.
- d.) The software for the **GMA 1347** Audio Panel begins to load. Monitor the upload status as it progresses.
- e.) After the files finish loading, press **ENT** to acknowledge the “UPLOAD COMPLETE” prompt.
- f.) Check the SUMMARY field to ensure the load is “COMPLETE”.

S1.10 . . . GDC 74A Air Data Computer Software:

- a.) Highlight the **GDC** software file. Ensure that **GDC** to **GIA** data path appears in the LRU field.
- b.) Press the **LOAD** softkey.
- c.) Select **OK** and press the **ENT** key to acknowledge the “BEGIN FILE UPLOAD” prompt.
- d.) The software for the **GDC 74A Air Data Computer** begins to load. There are two files that load to the GDC 74A: “**System SW**” and “**FPGA**”. These load one after the other, automatically. Monitor the upload status as it progresses.
- e.) After the files finish loading, press **ENT** to acknowledge the “UPLOAD COMPLETE” prompt.
- f.) Check the SUMMARY field to ensure that both the **System Code Region** and the **FPGA** loads are “COMPLETE”.

S1.11 . . . GRS 77 AHRS Software:

- a.) Highlight the **GRS** software file. Ensure that the **GRS** to **GIA** data path appears in the LRU field.
- b.) Press the **LOAD** softkey.
- c.) Select **OK** and press the **ENT** key to acknowledge the “BEGIN FILE UPLOAD” prompt.
- d.) The software for the **GRS 77AHRS** begins to load. There are two files that load to the GRS 77: “**System SW**” and “**FPGA**”. These load one after the other, automatically. Monitor the upload status as it progresses.

- e.) After the files finish loading, press the **ENT** key to acknowledge the “UPLOAD COMPLETE” prompt.
- f.) Check the SUMMARY field to ensure that both the **System Code Region** and the **FPGA** loads are “COMPLETE”.

S1.12 . . . GMU 44 Magnetometer Software:

- a.) Highlight the **GMU** software file. Ensure that **GMU1** appears in the LRU field.
- b.) Press the **LOAD** softkey.
- c.) Select **OK** and press the **ENT** key to acknowledge the “BEGIN FILE UPLOAD” prompt.
- d.) The software for the **GMU 44** begins to load. There are two files that load to the GMU 44: “**System SW**” and “**FPGA**”. These load one after the other, automatically. Monitor the upload status as it progresses.
- e.) After the files finish loading, press the **ENT** key to acknowledge the “UPLOAD COMPLETE” prompt.
- f.) Check the SUMMARY field to ensure that both the **System Code Region** and the **FPGA** loads are “COMPLETE”.

S1.13 . . . GTX 33 Transponder Software:

- a.) Highlight the **GTX** software file. Ensure that both paths to the **GTX 33** through **GIA1** and **GIA2** appear in the LRU field.
- b.) Press the **LRU** softkey. Select the **GTX1 - GIA1** data path to load software. Press the **LOAD** softkey.
- c.) Select **OK** and press the **ENT** key to acknowledge the “BEGIN FILE UPLOAD” prompt.
- d.) The software for the **GTX 33** transponder begins to load. Monitor the upload status as it progresses.
- e.) After the files finish loading, press the **ENT** key to acknowledge the “UPLOAD COMPLETE” prompt.
- f.) Check the SUMMARY field to ensure that the load is “COMPLETE”.

S1.14 . . . GEA 71 Engine/Airframe Unit Software:

- a.) Highlight the **GEA** software file. Ensure that both paths to the **GEA 71** through **GIA1** and **GIA2** appear in the LRU field.
- b.) Press the **LRU** softkey. Select the **GEA - GIA1** data path to load software. Press the **LOAD** softkey.
- c.) Select **OK** and press the **ENT** key to acknowledge the “BEGIN FILE UPLOAD” prompt.
- d.) The software for the **GEA 71 Engine/Airframe Unit** begins to load. Monitor the upload status as it progresses.
- e.) After the files finish loading, press the **ENT** key to acknowledge the “UPLOAD COMPLETE” prompt.
- f.) Check the SUMMARY field to ensure the all software loads are “COMPLETE”.
- g.) De-activate the cursor.

S1.15 . . . Final LRU Configuration:

- a.) Go to the Configuration Upload page using the **FMS** knob.
- b.) Activate cursor and rotate the **FMS** knob once to activate the **FILE** menu.
- c.) Select Aircraft model “**(M20M, M20R, M20TN) - Base Configuration**” and press **ENT**.
- d.) Highlight the **GMA 1** configuration file.
- e.) Press the **LOAD** softkey.

- f.) Select **YES** and press **ENT** to acknowledge the “CONFIRMATION UPLOAD” prompt.
- g.) Monitor the status of the upload. When the upload is finished, press the **ENT** key to acknowledge the “UPLOAD COMPLETE” confirmation.
- h.) Repeat Steps 5 through 7 for **GTX 1, GEA 1, GDC 1, CALIBRATION**, and **AUDIO** configuration files.
- i.) Ensure that all configuration files (**GMA 1, GTX 1, GEA 1, GDC 1, CALIBRATION**, and **AUDIO**) are “COMPLETE” in the SUMMARY field.
- j.) Deactivate the cursor.

S1.16 . . . Final Configuration Items:

S1.17 . . . Optional Equipment Configuration: (Verify Equipment Installed on Aircraft)

S1.18 . . . M20 OPTION - Extended Range Fuel Tanks - 102 or 130 Gallons (if installed):

If the M20 aircraft being checked out is equipped with long range fuel tanks, follow this procedure to configure the G1000. If the M20 is not equipped with this option, this procedure MUST be skipped.

- a.) Go to the Configuration Upload page using the **FMS** knob.
- b.) Activate cursor and rotate the **FMS** knob once to activate the **FILE** menu.
- c.) Select tank type as appropriate, and press **ENT**.
M20M, M20R, M20TN) Option - 102 Gallon Extended Range Tanks
M20M, M20R, M20TN Option - 130 Gallon Extended Range Tanks
- d.) Press the **LOAD** softkey.
- e.) Select **YES** and press **ENT** to acknowledge the “CONFIGURATION UPLOAD” prompt.
- f.) Monitor the status of the upload. When the upload is finished, press the **ENT** key to acknowledge the “UPLOAD COMPLETE” confirmation.
- g.) View the SUMMARY field and ensure that the listed item is “COMPLETE”.

S1.19 . . . M20 OPTION - WX-500 Stormscope (if installed):

If the M20 aircraft being updated is equipped with the WX-500 Stormscope, follow this procedure to configure the G1000. If the M20 is not equipped with this option, this procedure MUST be skipped.

- a.) Go to the Configuration Upload page using the **FMS** knob.
- b.) Activate cursor and rotate the **FMS** knob once to activate the **FILE** menu.
- c.) Select “**(M20M, M20R, M20TN) Option - Stormscope WX-500**”, and press **ENT**.
- d.) Press the **LOAD** softkey.
- e.) Select **YES** and press **ENT** to acknowledge the “CONFIGURATION UPLOAD” prompt.
- f.) Monitor the status of the upload. When the upload is finished, press the **ENT** key to acknowledge the “UPLOAD COMPLETE” confirmation.
- g.) View the SUMMARY field and ensure that the listed item is “COMPLETE”.

S1.20 . . . M20 OPTION - SKY497 Skywatch (if installed):

If the M20 aircraft being updated is equipped with the SKY497 Skywatch, follow this procedure to configure the G1000. If the M20 is not equipped with this option, this procedure MUST be skipped.

- a.) Go to the Configuration Upload page using the **FMS** knob.
- b.) Activate the cursor and use the small **FMS** knob to highlight the “**(M20M, M20R, M20TN) Option - Skywatch**” in the FILE field.

- IMPORTANT -

Ensure that the correct option file is selected before proceeding; otherwise, incorrect configuration information will be loaded.

- c.) Press the **ENT** key to select the Skywatch Option. Once the option is selected the configuration files in the SECTION field will be displayed.
- d.) Press the **LOAD ALL** softkey.
- e.) Select **YES** and press **ENT** to acknowledge the "CONFIGURATION UPLOAD" prompt.
- f.) Monitor the status of the upload. When the upload is finished, press the **ENT** key to acknowledge the "UPLOAD COMPLETE" confirmation.
- g.) View the SUMMARY field and ensure that the listed item is "COMPLETE".

S1.21 . . . M20 OPTION - Becker ADF (if installed):

If the M20 aircraft being updated is equipped with the Becker model RA3502 ADF, follow this procedure to configure the G1000. If the M20 is not equipped with this option, this procedure **MUST** be skipped.

- a.) Go to the Configuration Upload page using the **FMS** knob.
- b.) Activate cursor and rotate the small **FMS** knob once to activate the **FILE** menu.
- c.) Select "**(M20M, M20R, M20TN) Option - Becker 3502 ADF**", and press **ENT**.
- d.) Press the **LOAD ALL** softkey.
- e.) Select **YES** and press **ENT** to acknowledge the "CONFIGURATION UPLOAD" prompt.
- f.) Monitor the status of the upload. When the upload is finished, press the **ENT** key to acknowledge the "UPLOAD COMPLETE" confirmation.
- g.) View the SUMMARY field and ensure that the listed item is "COMPLETE".

S1.22 . . . M20 OPTION - KN 63 DME (if installed):

If the M20 aircraft being updated is equipped with the Honeywell model KN63 DME, follow this procedure to configure the G1000. If the M20 is not equipped with this option, this procedure **MUST** be skipped.

- a.) Go to the Configuration Upload page using the **FMS** knob.
- b.) Activate cursor and rotate the small **FMS** knob once to activate the **FILE** menu.
- c.) Select "**(M20M, M20R, M20TN) Option - KN63 DME**", and press **ENT**.
- d.) Press the **LOAD ALL** softkey.
- e.) Select **YES** and press **ENT** to acknowledge the "CONFIGURATION UPLOAD" prompt.
- f.) Monitor the status of the upload. When the upload is finished, press the **ENT** key to acknowledge the "UPLOAD COMPLETE" confirmation.
- g.) View the SUMMARY field and ensure that the listed item is "COMPLETE".

S1.23 . . . M20 OPTION - GDL69 (if installed):

If the M20 aircraft being updated is equipped with the GARMIN GDL 69/69A, follow this procedure to configure the G1000. If the M20 is not equipped with this option, this procedure **MUST** be skipped.

GDL 69/69A Initial Configuration:

- a.) Go to the Configuration Upload page using the **FMS** knob.
- b.) Activate cursor and rotate the small **FMS** knob once to activate the **FILE** menu.
- c.) Select "**(M20M, M20R, M20TN) Option - GDL69**", and press **ENT**.
- d.) Press the **LOAD ALL** softkey.

- e.) Select **YES** and press **ENT** to acknowledge the “CONFIGURATION UPLOAD” prompt.
- f.) Monitor the status of the upload. When the upload is finished, press the **ENT** key to acknowledge the “UPLOAD COMPLETE” confirmation.
- g.) View the SUMMARY field and ensure that the listed item is “COMPLETE”.

GDL 69/69A Initial Software:

- a.) Go to the Software Upload page.
- b.) Activate the cursor and select the **GDL69** software file. Verify that **GDL69** path appears in the LRU field, indicating the installed **SW** version.
- c.) Press the **LOAD** softkey.
- d.) Select **OK** and press **ENT** to acknowledge the “FILE UPLOAD” prompt.
- e.) The software for the **GDL69** begins to load. Monitor the upload status as it progresses.
- f.) After the files finish loading, press **ENT** to acknowledge the “UPLOAD COMPLETE” prompt:
- g.) View the SUMMARY field and verify that **GDL69** software loading is “COMPLETE”.

GDL 69/69A Final Configuration:

- a.) Go to the Configuration Upload page using the **FMS** knob.
- b.) Activate cursor and rotate the small **FMS** knob once to activate the **FILE** menu.
- c.) Select “**(M20M, M20R, M20TN) Option - GDL69**”, and press **ENT**.
- d.) Use the large **FMS** knob to highlight “**GDL69**” in the SECTION window.
- e.) Press the **LOAD** softkey.
- f.) Select **YES** and press **ENT** to acknowledge the “CONFIGURATION UPLOAD” prompt.
- g.) Monitor the status of the upload. When the upload is finished, press the **ENT** key to acknowledge the “UPLOAD COMPLETE” confirmation.
- h.) View the SUMMARY field and ensure that the listed item is “COMPLETE”.

S1.24 . . . M20 OPTION - GFC 700 AFCS (if installed):

- a.) Go to the Configuration Upload page using the **FMS** knob.
- b.) Activate cursor and turn the **FMS** knob once to open the **FILE** selection window. Press **ENT** to select the “**(M20M, M20R, M20TN) Option - GFC 700**” file group.
- c.) Use the cursor to highlight “**AIRFRAME**” in the SECTION field.
- d.) Press the **LOAD** softkey.
- e.) Select **YES** and press **ENT** to acknowledge the “CONFIGURATION UPLOAD” prompt.
- f.) Monitor the status of the upload. When the upload is finished, press the **ENT** key to acknowledge the “UPLOAD COMPLETE” confirmation.
- g.) Highlight “**GIA 1**” in the SECTION field and repeat Steps 4 through 6.
- h.) Highlight “**GIA 2**” in the SECTION field and repeat Steps 4 through 6.
- i.) Highlight “**PF1 1**” in the SECTION field and repeat Steps 4 through 6.
- j.) Highlight “**MFD 1**” in the SECTION field and repeat Steps 4 through 6.
- k.) View the SUMMARY field and ensure that all items are “COMPLETE”.
- l.) De-activate the cursor.
- m.) Return to the Software Upload page using the **FMS** knob.

S1.25 . . . M20 OPTION - KULITE TRANSDUCER: (Oil Pressure, Manifold Pressure, etc.)

If the M20 aircraft being updated is equipped with the KULITE transducers, follow this procedure to configure the G1000. If the M20 is not equipped with this option, this procedure MUST be skipped.

- a.) Go to the Configuration Upload page using the **FMS** knob.
- b.) Activate cursor and rotate the **FMS** knob once to activate the **FILE** menu.
- c.) Select "**Option - KULITE TRANSDUCERS**", and press **ENT**.
- d.) Press the **LOAD** softkey.
- e.) Select **YES** and press **ENT** to acknowledge the "CONFIGURATION UPLOAD" prompt.
- f.) Monitor the status of the upload. When the upload is finished, press the **ENT** key to acknowledge the "UPLOAD COMPLETE" confirmation.
- g.) View the SUMMARY field and ensure that the listed item is "COMPLETE".
- h.) De-activate the cursor.
- i.) Return to the Software Upload page using the **FMS** knob.

S1.26 . . . GSA 81 Servo Software:

- a.) Highlight the **GSA 81** software file. Ensure that each **GSA** to **GIA** data path appears in the LRU field as shown. Each servo axis is identified by the letters "**P**" for pitch, "**R**" for roll, and "**PT**" for pitch trim. Each servo consists of a monitor, denoted by the letter "**M**", and a controller, denoted by the letter "**C**". Each servo interfaces to GIA1 and GIA2.
- b.) Press the **LRU** softkey to highlight **servo-to-GIA** paths.
- c.) With the first line item in the LRU window selected, press the **LOAD** softkey.
- d.) Select **YES** and press the **ENT** key to acknowledge the "FILE UPLOAD" prompt.
- e.) The software for the **GSA 81** servo begins to load. Monitor the upload status as it progresses.
- f.) After the files finish loading, press the **ENT** key to acknowledge the "UPLOAD COMPLETE" prompt.
- g.) Check the SUMMARY field to ensure each load is "COMPLETE".
- h.) Highlight each next **servo-to-GIA1** path and repeat Steps 3 through 7. The **servo-to-GIA2** paths should not be loaded.

S1.27 . . . Reset GSA 81 Certification Gains:

- a.) Go to the **GFC** page group and then the **GFC STATUS** page using the **FMS** knob.
- b.) Verify **GIA 1** is shown in the **SELECT UNIT** window. If not, activate the cursor and rotate the **FMS** knob once to activate the **SELECT UNIT** menu. Select **GIA 1** and press **ENT**.
- c.) Use the **FMS** knob to go to the **SELECT SERVO AXIS** window. Activate the cursor and rotate the **FMS** knob once to activate the **SELECT SERVO AXIS** menu. Select **PITCH SERVO** and press **ENT**.
- d.) Press the **RST GAIN** softkey. A confirmation pop-up message will appear. Select **OK** to reset gain and press **ENT**.
- e.) Repeat Steps 2 and 3 for **ROLL SERVO**.
- f.) Repeat Steps 2 and 3 for **PITCH TRIM SERVO**.

S1.28 . . . GSA 81 Certification Gains Software:

- a.) Highlight the **GFC700 Certification Gains** software file.
- b.) Press the **LRU** softkey to toggle the cursor to the **LRU** window. The first line item in the LRU field should be selected by default.
- c.) Press the **LOAD** softkey to start loading the first line item.

- d.) Select **YES** and press the **ENT** key to acknowledge the “FILE UPLOAD” prompt.
- e.) The **GFC 700 certification gains** software begins to load. Monitor the upload status as it progresses.
- f.) After the file finishes loading, press the **ENT** key to acknowledge the “UPLOAD COMPLETE” prompt.
- g.) Check the SUMMARY field to ensure the load is “COMPLETE”.
- h.) Highlight each subsequent **GFC1 CERT** file in the LRU window and repeat steps 3 through 7.
- i.) Highlight **GFC 2 CERT GIA** file in the LRU window and repeat steps 3 through 7.
- j.) The remaining **GFC 2 CERT** files do **not** need to be loaded.
- k.) Remove the **Loader Card** from the PFD.

S1.29 . . . Terrain/Obstacle Database Cards:

- a.) Remove power from the PFD and MFD using the respectively labeled circuit breakers.
- b.) Insert the **Terrain/Obstacle** database cards into the lower slots of the PFD and MFD.

CHECKS AND TESTING

C1.1 GFC 700 GROUND CHECKS:

The following procedure will verify the proper operation of the GFC 700 AFCS. This procedure is designed to test the installation of the AFCS only after the G1000 testing has been conducted. The technician performing these checks must be thoroughly familiar with the GFC 700 by studying the following:

M20M/M20R G1000 Cockpit Reference Guide, GARMIN P/N 190-00450-02 Revision A or later Various references are made to the following documents in this section:

M20M/M20R GFC 700 Pitch Servo Installation Drawing, GARMIN P/N 005-00343-05 Revision 3 or later

M20M/M20R GFC 700 Roll Servo Installation Drawing, GARMIN P/N 005-00343-06 Revision 3 or later

M20M/M20R GFC 700 Pitch Trim Servo Installation Drawing, GARMIN P/N 005-00343-07 Revision 3 or later

M20M/M20R GFC 700 System Maintenance Manual, GARMIN P/N 190-00638-01 Revision A or later

NOTE:

In the sections that follow, an Autopilot disconnect should be accompanied by an aural alert (two-second tone) unless otherwise specified.

C1.2 Pre-Flight Test

- a.) Power down the G1000 system using the **MASTER** switch. If a ground power unit is being used, it too must be powered off. Wait 30 seconds then restore power to the system.

NOTE:

Make sure Autopilot switch is in the “OFF” position until AHRS and ADC becomes valid.

The GFC700 will begin an automatic pre-flight test after **AHRS** and **ADC** parameters become valid.

- b.) Verify that a white “**PFT**” annunciation is displayed on the PFD. A red **AFCS** annunciation may be displayed momentarily before PFT starts. This indicates that the Autopilot and Manual Electric Trim are not available (due to system failure, power loss, or PFT has not been performed)
- c.) Upon successful completion of the test, an aural alert will sound and the annunciation will clear.

NOTE:

If the aural alert is not heard, but the PFT annunciation cleared, engage the Autopilot by pressing the AP key and disengage the Autopilot by pressing the AP key again. Visual and aural disconnect alerting should occur. If no alert is heard, the audio interface between the GIA and audio panel should be checked. Refer to the System Maintenance Manual

NOTE:

If the “PFT” annunciation turns red, the test has failed. Refer to the System Maintenance Manual for troubleshooting.

NOTE:

The aural alert is generated by either GIA 63 #1 or GIA 63 #2, alternately, with each system power-up. Thus, the PFT sequence must be run twice to verify both GIA units are providing the aural alert.

- d.) Repeat Step 1 to test the PFT aural alert for the other GIA 63.
- e.) Continue to Section 4.2.

C1.3 AFCS Switch Checks

To verify that the AFCS system buttons and switches are operating correctly, perform the following checks:

- a.) Actuate both sections of the manual electric trim (**TRIM UP/TRIM DN**) switch. The trim clutch should engage and the trim wheel should drive in the requested direction. Check operation in both the up and down direction.
- b.) Press the **AP DISC/TRIM INTER** button and hold while actuating the manual electric trim switch. Trim should not run and the trim wheel should rotate freely when moved manually. Release the **AP DISC/TRIM INTER** button and manual electric trim switch.
- c.) Engage the Autopilot by pressing the “**AP**” key on the MFD. Press and hold the left section of the manual electric trim switch. The Autopilot should disengage normally with an aural alert. The trim wheel should move and rotate freely when moved manually.
- d.) Engage the Autopilot again by pressing the “**AP**” key on the MFD. The pitch and roll clutches should engage, resisting movement of the control wheel. Press and hold the **CWS** switch. The control wheel should now move freely when moved manually.
- e.) Release the **CWS** switch and press the **AP DISC/TRIM INTER** switch. The Autopilot should disengage with a flashing amber “**AP**” annunciation on the PFD, accompanied by an aural alert. Verify that the control wheel is free in pitch and roll axes.
- f.) Engage the Autopilot again by pressing the “**AP**” key on the MFD. Use the **A/P POWER** switch to remove power to the system. The Autopilot should disconnect and the abnormal disconnect should be provided, consisting of a continuous aural alert and a flashing red/white “**AP**” annunciation. No AFCS annunciations (e.g. AFCS, PFT, Mistrim) should remain on the PFD. Press the **AP DISC/TRIM INTER** switch to cancel the abnormal alert. Use the **A/P POWER** switch to restore power to the system and wait for completion of the pre-flight test sequence.
- g.) Press the **GO AROUND** button on the instrument panel. “**GA**” should be annunciated on the PFD for both PITCH and ROLL modes and the command bars should be at 7 degrees nose up and wings-level.
- h.) Press the “**FD**” key on the MFD to deactivate the “**GA**” mode and turn off the **Flight Director**. Press the “**AP**” key to engage the Autopilot. Press the “**CWS**” button for at least 5 seconds and release; verifying there is no residual force on the control stick for the pitch axis. Extend the flaps to approach position. The trim wheel should immediately run in the **UP** direction. Retract the flaps. The trim should immediately run in the **DOWN** direction.
- i.) Disengage the Autopilot by pressing the **AP DISC/TRIM INTER** switch. Engage “**VS**” mode by pressing the “**VS**” key on the MFD. Verify the PFD display “**VS**” in green and indicates a pitch reference of “0 FPM”.

- j.) Press the **FLC** key on the MFD and verify that “**FLC**” is annunciated on the PFD in green with a reference of 80 KTS (NOTE: This is the minimum speed reference for the GFC 700 in the Mooney M20M, M20R, M20TN).
- k.) Press the **ALT** key on the MFD and verify that the “**ALT**” annunciation is displayed in green on the PFD with an altitude reference equal to the aircraft altitude (within the nearest 20 feet).
- l.) Press the **FD** key and verify that the mode annunciations and command bars are removed from the display.

C1.4 Autopilot Clutch Overpower Check:

The GFC 700 uses electronic torque limiting as well as mechanical slip clutches to limit the maximum servo effort. When the system is on the ground, the electronic torque limiting is removed, allowing manual checks of the slip-clutch settings.

- a.) Engage the Autopilot by pressing the **AP** key on the MFD.
- b.) Manually overpower the Autopilot clutches in pitch and roll. If the Autopilot clutches cannot be overpowered, check the servo clutch torque settings. Refer to the pitch or roll servo installation drawing as applicable.
- c.) Actuate and hold the manual electric trim switch in either the UP or DOWN direction to disconnect the Autopilot. While the trim is running, restrain the aircraft pitch trim wheel and verify that the trim clutch can be overpowered. If it cannot be overpowered, check the trim servo clutch torque setting. Refer to the pitch trim servo installation drawing.
- d.) Engage the Autopilot by pressing the **AP** key on the MFD. Actuate and hold the manual electric trim switch in either the up or down direction to disconnect the Autopilot. Verify that the trim wheel moves smoothly in both directions throughout the entire trim range during manual electric trim operation. If the trim wheel hesitates, this may indicate that the pitch trim clutch is slipping and proper clutch setting and cable tension should be verified. Refer to the applicable MAC System Maintenance Manual. If both clutch setting and cable tension are within tolerance, check the aircraft pitch trim system for excessive friction. Refer to the applicable MAC Mooney Maintenance Manual.

C1.4 Post Maintenance Check Flight:

- a.) Perform a Post Maintenance Check Flight per GFC700 Flight Manual Supplement to check proper operation of the Manual Electric Trim system (refer to the M20M, M20R, M20TN aircraft POH/AFM Supplement “GARMIN GFC 700 AUTOMATIC FLIGHT CONTROL SYSTEM AND TAWS OPTION”).