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# **Technical Bulletin**

## **Dual Digital Clock/USB Charger Installation**

**Bell 212**

**TBN-212-002**

Revision A

November 19, 2022

Prepared: \_\_\_\_\_

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M. Peters

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## Revision Record

Rev	Date	Description of Revision
A	See Cover Page	Initial Release.

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## 1. Introduction

### 1.1. Approval

This Technical Bulletin is approved data in accordance with the following STC:

TCCA STC: SH07-28

FAA STC: SR02831NY

NOTE: The subject installation invokes limitations on the use of the USB charging ports in accordance with Flight Manual Supplement FMS-D212-725-1.

### 1.2. Purpose

This Technical Bulletin provides instructions for the installation of two Mid-Continent CH93 Digital Clocks in the instrument panel.

### 1.3. Effectivity

MSN
All

### 1.4. Prerequisites

This Technical Bulletin has two configurations, -011 and -013. Installations incorporating the -011 configuration require the incorporation of TBN-212-001, which installs the collective switch required for flight time tracking. Installations incorporating the -013 configuration have no prerequisites except the incorporation of the STC mentioned in Section 1.1.

### 1.5. Compliance

Optional.

### 1.6. Description

This Technical Bulletin provides information required for the installation of two Mid-Continent CH93 Digital Clocks in the instrument panel. These clocks include 2 USB-A charging ports each. The -011 configuration of this Technical Bulletin includes instructions for activating the flight time tracking functionality of the clocks. The -013 configuration of this Technical Bulletin does not activate the flight time tracking functionality.

## 2. Installation Data

### 2.1. Parts List

Item	-011 Qty	-013 Qty	Part Number	Description
1	2	2	6420093-2	CHRONOS Digital Clock / High-Power USB Charger
2	2	2	9018178	Connector Kit
3	2	2	MS22073-2	Circuit Breaker, 2A
4	30 ft	10 ft	M22759/41-22-9	Unshielded Wire, 22 AWG
5	4	2	M39029/22-192	Contact, Socket

Table 1 – Parts List

Item	-011 Qty	-013 Qty	Part Number	Description
1	2	2	811B-24	Davtron Digital Clock
2	2	2	MS22073-1	Circuit Breaker, 1A

Table 2 – Removed Parts

### 2.2. Weight and Balance

The incorporation of the Technical Bulletin has a negligible effect on the rotorcraft weight and balance.

### 2.3. Electrical Loads

System	Start & Warm-up 15 Min.	Take-off 15 Min.	Cruise 15 Min.	Land 15 Min.
Total for all DC Busses	50.9 A	109.7 A	114.0 A	110.2 A
TBN-212-002 (Max)	2.6 A	2.6 A	2.6 A	2.6 A
<b>Total</b>	<b>53.5 A</b>	<b>112.3 A</b>	<b>116.6 A</b>	<b>112.8 A</b>

Table 3 – Electrical Loads

### 3. Installation Procedure

1. Disconnect the battery and external power in accordance with ICA-D212-725.

**WARNING:**

OBEY ALL THE SAFETY PRECAUTIONS WHEN PERFORMING MAINTENANCE ON OR NEAR ELECTRICAL/ELECTRONIC EQUIPMENT.

2. Locate and remove the existing clocks (PN: 811B-24) from the pilot and copilot instrument panel. Cut and discard splices.
3. Re-terminate CL1B22 and CL3A22N wire to the new connector 9500-1P1 as shown in Figure 4 or Figure 5, as applicable.
4. Re-terminate CL2B22 and CL4A22N wire to the new connector 9500-2P1 as shown in Figure 4 and Figure 5, as applicable.
5. Install the rest of the wiring in accordance with Figure 4 or Figure 5, as applicable.
6. Locate and remove the existing "COPILOT CLOCK" and "PILOT CLOCK" circuit breakers (PN: MS22073-1) from the overhead circuit breaker panel. Install the new circuit breakers (PN: MS22073-2) in the same locations. Refer to Figure 2. Circuit breaker panels and labeling may be slightly different than depicted.
7. If required, cut the instrument panel for the Digital Clock/USB Charger in accordance with Figure 1. Touch up CCC, primer, and paint in accordance with Table 4.
8. Install each clock (PN: 6420093-2) into the mounting hole and secure the clocks to the instrument panel using the #6-32 fasteners included in the connector kit (PN: 9018178).
9. Install the placard shown in Figure 3 ("MAX CABLE LENGTH 8 INCHES", font height .09", white text on black background), or equivalent, below each clock.

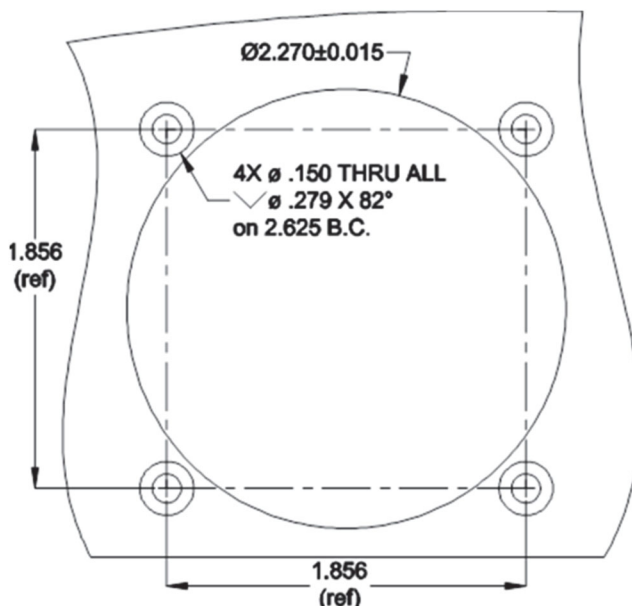


Figure 1 – Panel Mounting Holes

Process	Material Specification
CCC	MIL-DTL-5541 Type I Class 1A
Primer	MIL-PRF-23377 Type I Class C2
Paint	MIL-PRF-85285 Type I Class H or Equivalent

Table 4 – Finish Specifications

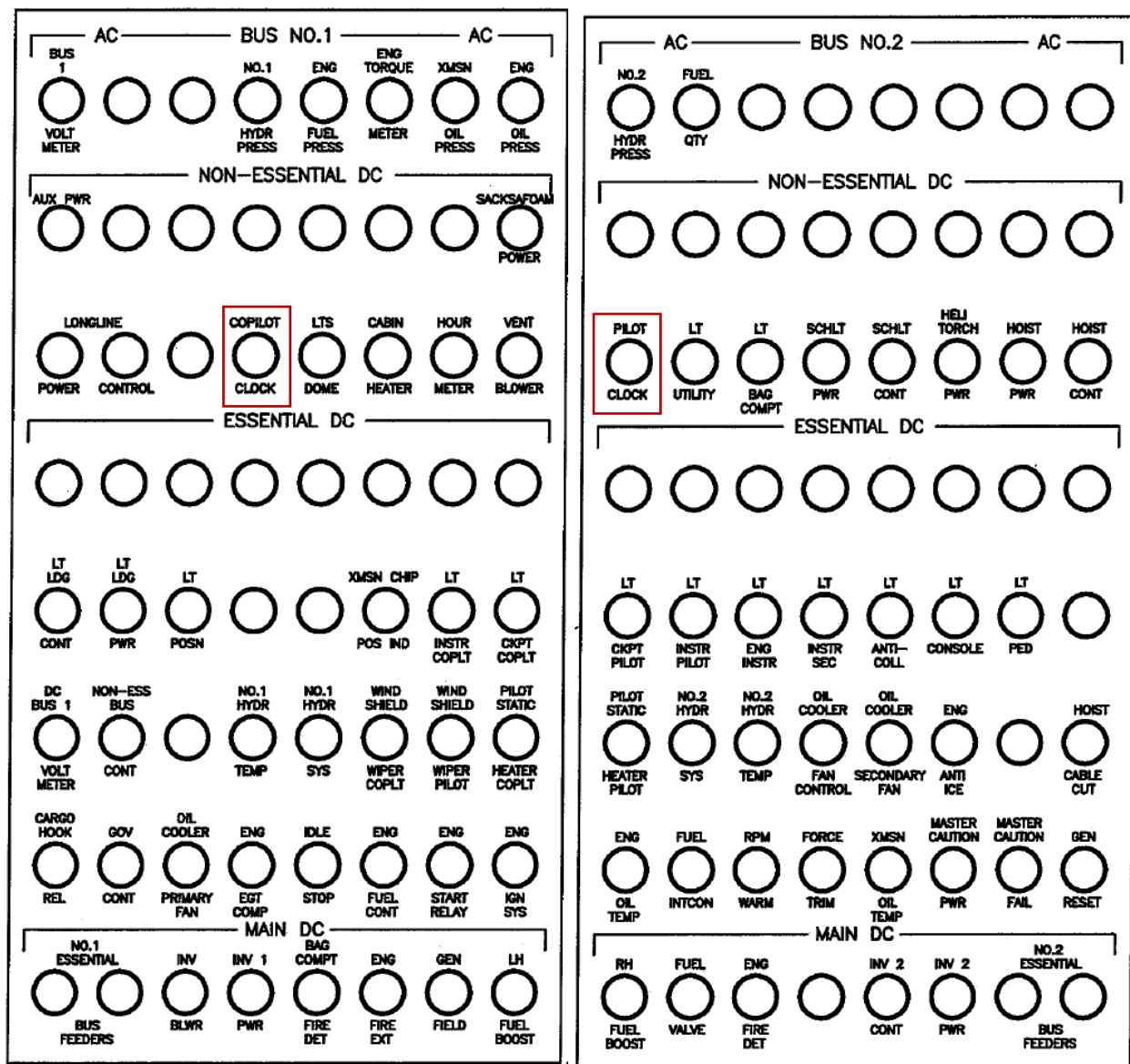
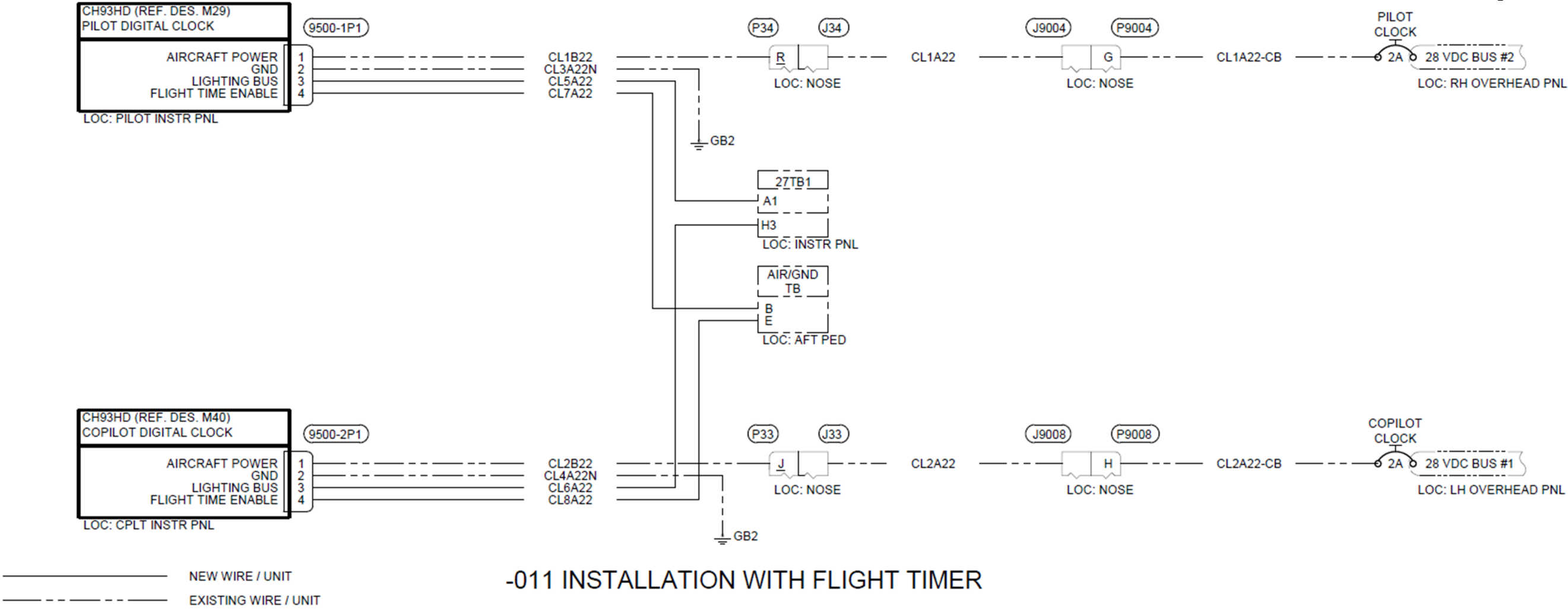


Figure 2 – Circuit Breaker Installation, Overhead Panels

**MAX CABLE LENGTH  
8 INCH**

Figure 3 – Cable Length Limitation Placard (Font Height: .09", White on Black)

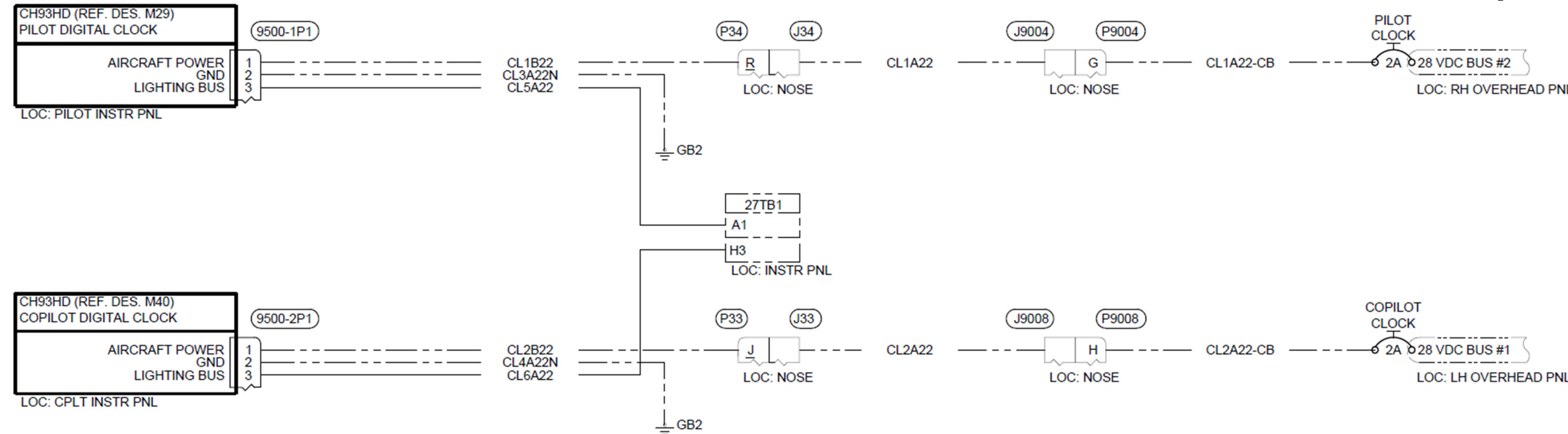


NOTES:

1. PERFORM ALL WORK IN ACCORDANCE WITH BELL HELICOPTER STANDARD PRACTICES MANUAL BHT-ELEC-SPM.
2. ALL NEW UNSHIELDED WIRE USE M22759/41-(XX)-9 OR EQUIVALENT TYPE WIRE. (M22759/41-(XX)-9 IS NOT INTENDED TO BE USED IN SOLDER APPLICATIONS, SOLDERABILITY CAN BE ACHIEVED WITH THE PROPER SOLDER. USE CRIMP SPLICES FOR REPAIR). ALL WIRES 22 AWG UNLESS OTHERWISE SPECIFIED BY WIRE CODE. ALL JUMPERS TO BE LESS THAN 6 INCHES.
3. ALL NEW SHIELDED WIRE USE M27500-(XX)SM(X)N23 OR EQUIVALENT TYPE WIRE. (M27500-(XX)SM(X)N23 IS NOT INTENDED TO BE USED IN SOLDER APPLICATIONS, SOLDERABILITY CAN BE ACHIEVED WITH THE PROPER SOLDER. USE CRIMP SPLICES FOR REPAIR). SOLDER SLEEVES SHALL USE SN96 SOLDER, USE P/N S200-X-00 OR EQUIVALENT.
4. ALL AIRFRAME GROUNDS SHALL BE VIA AMP LUG OR GROUNDING BLOCK AND PROVIDE SEPARATE GROUND STUD LOCATIONS FOR DC POWER GROUNDS, AC POWER GROUNDS, CHASSIS GROUNDS, SIGNAL GROUNDS AND SHIELD GROUNDS.
5. ALL EQUIPMENT BONDING TO ADJACENT AIRFRAME STRUCTURE TO BE 0.003 OHM OR LESS. ALL ELECTRICAL GROUNDING AND BONDING TO BE INSTALLED IN ACCORDANCE WITH THE LATEST REVISION OF BHT-ELEC-SPM CHAPTER 8.
6. ALL CONNECTORS TO BE INSTALLED IN ACCORDANCE WITH THE LATEST REVISION OF BHT-ELEC-SPM CHAPTER 5 AND / OR CIRCULAR CONNECTOR INSTALLATION INSTRUCTIONS. ENSURE ALL UNUSED CONNECTOR CONTACTS ARE FILLED WITH SPARE PINS/SOCKETS OR PLASTIC GROMMET SEALING PLUGS. ENSURE ALL BULKHEAD MOUNTED CONNECTORS ARE PROPERLY BONDED TO AIRFRAME.
7. ROUTE ALL WIRES AND CABLES WITH EXISTING WIRE ROUTES WHERE POSSIBLE AND CLAMP IN ACCORDANCE WITH THE LATEST REVISION OF BHT-ELEC-SPM CHAPTER 6. WIRES MUST BE ROUTED WITH A MINIMUM OF 6 INCHES OF SEPARATION FROM OXYGEN AND FLUID LINES (MIN 2 INCHES IF WIRES IN CONDUIT).
8. INSTALL SYSTEM IN ACCORDANCE WITH THE LATEST REVISION OF THE MANUFACTURER INSTALLATION MANUAL.
9. LOWERCASE LETTER CONNECTOR PIN DESIGNATORS ARE SHOWN AS UNDERLINED UPPERCASE LETTERS.

Figure 4 – TBN-212-002 Wiring Diagram, -011 Installation





### -013 INSTALLATION WITHOUT FLIGHT TIMER

NOTES:

—————	NEW WIRE / UNIT
-----	EXISTING WIRE / UNIT

1. PERFORM ALL WORK IN ACCORDANCE WITH BELL HELICOPTER STANDARD PRACTICES MANUAL BHT-ELEC-SPM.
2. ALL NEW UNSHIELDED WIRE USE M22759/41-(XX)-9 OR EQUIVALENT TYPE WIRE. (M22759/41-(XX)-9 IS NOT INTENDED TO BE USED IN SOLDER APPLICATIONS, SOLDERABILITY CAN BE ACHIEVED WITH THE PROPER SOLDER. USE CRIMP SPLICES FOR REPAIR). ALL WIRES 22 AWG UNLESS OTHERWISE SPECIFIED BY WIRE CODE. ALL JUMPERS TO BE LESS THAN 6 INCHES.
3. ALL NEW SHIELDED WIRE USE M27500-(XX)SM(X)N23 OR EQUIVALENT TYPE WIRE. (M27500-(XX)SM(X)N23 IS NOT INTENDED TO BE USED IN SOLDER APPLICATIONS, SOLDERABILITY CAN BE ACHIEVED WITH THE PROPER SOLDER. USE CRIMP SPLICES FOR REPAIR). SOLDER SLEEVES SHALL USE SN96 SOLDER, USE P/N S200-X-00 OR EQUIVALENT.
4. ALL AIRFRAME GROUNDS SHALL BE VIA AMP LUG OR GROUNDING BLOCK AND PROVIDE SEPARATE GROUND STUD LOCATIONS FOR DC POWER GROUNDS, AC POWER GROUNDS, CHASSIS GROUNDS, SIGNAL GROUNDS AND SHIELD GROUNDS.
5. ALL EQUIPMENT BONDING TO ADJACENT AIRFRAME STRUCTURE TO BE 0.003 OHM OR LESS. ALL ELECTRICAL GROUNDING AND BONDING TO BE INSTALLED IN ACCORDANCE WITH THE LATEST REVISION OF BHT-ELEC-SPM CHAPTER 8.
6. ALL CONNECTORS TO BE INSTALLED IN ACCORDANCE WITH THE LATEST REVISION OF BHT-ELEC-SPM CHAPTER 5 AND / OR CIRCULAR CONNECTOR INSTALLATION INSTRUCTIONS. ENSURE ALL UNUSED CONNECTOR CONTACTS ARE FILLED WITH SPARE PINS/sockets OR PLASTIC GROMMET SEALING PLUGS. ENSURE ALL BULKHEAD MOUNTED CONNECTORS ARE PROPERLY BONDED TO AIRFRAME.
7. ROUTE ALL WIRES AND CABLES WITH EXISTING WIRE ROUTES WHERE POSSIBLE AND CLAMP IN ACCORDANCE WITH THE LATEST REVISION OF BHT-ELEC-SPM CHAPTER 6. WIRES MUST BE ROUTED WITH A MINIMUM OF 6 INCHES OF SEPARATION FROM OXYGEN AND FLUID LINES (MIN 2 INCHES IF WIRES IN CONDUIT).
8. INSTALL SYSTEM IN ACCORDANCE WITH THE LATEST REVISION OF THE MANUFACTURER INSTALLATION MANUAL.
9. LOWERCASE LETTER CONNECTOR PIN DESIGNATORS ARE SHOWN AS UNDERLINED UPPERCASE LETTERS.

Figure 5 – TBN-212-002 Wiring Diagram, -013 Installation

#### 4. Test Procedure

1. Ensure that the circuit breakers are pulled and collared. Disconnect the clock connectors.
2. Check all pins for shorts to ground or adjacent pins.
3. Ensure that all cables are properly secured in accordance with Figure 4 or Figure 5, as applicable.
4. Perform a ground bonding check on each clock. Record the measurements to airframe ground in Table 5 below.

LRU Point	Ground Point	Measurement	Pass/Fail
Suitable ground location on the copilot clock	Airframe ground on or near the instrument panel	3 milliohms (< 0.003Ω)	Resistance: _____Ω Pass: <input type="checkbox"/> Fail: <input type="checkbox"/> Initial: _____
Suitable ground location on the pilot clock	Airframe ground on or near the instrument panel	3 milliohms (< 0.003Ω)	Resistance: _____Ω Pass: <input type="checkbox"/> Fail: <input type="checkbox"/> Initial: _____

**Table 5 – Bonding Check Results**

5. Connect ground power and turn on aircraft power in accordance with ICA-D212-725.

**WARNING:**

OBEY ALL THE SAFETY PRECAUTIONS WHEN PERFORMING MAINTENANCE ON OR NEAR ELECTRICAL/ELECTRONIC EQUIPMENT.

6. Remove collars and push in the clock circuit breakers.
7. If installing the -011 configuration:
  - a. On connector 9500-1P1, check the following pins.

PIN	MEASUREMENT	PASS/FAIL
1	+28 Vdc relative to ground	Pass: <input type="checkbox"/> Fail: <input type="checkbox"/> Initial: _____
2	<0.5 Ω to ground	Pass: <input type="checkbox"/> Fail: <input type="checkbox"/> Initial: _____
3	Voltage varies with PILOT INSTR LT dial	Pass: <input type="checkbox"/> Fail: <input type="checkbox"/> Initial: _____
4	No continuity to ground	Pass: <input type="checkbox"/> Fail: <input type="checkbox"/> Initial: _____

- b. On connector 9500-2P1, check the following pins.

PIN	MEASUREMENT	PASS/FAIL
1	+28 Vdc relative to ground	Pass: <input type="checkbox"/> Fail: <input type="checkbox"/> Initial: _____
2	<0.5 Ω to ground	Pass: <input type="checkbox"/> Fail: <input type="checkbox"/> Initial: _____
3	Voltage varies with COPLT INSTR LT dial	Pass: <input type="checkbox"/> Fail: <input type="checkbox"/> Initial: _____
4	No continuity to ground	Pass: <input type="checkbox"/> Fail: <input type="checkbox"/> Initial: _____

8. If installing the -013 configuration:

a. On connector 9500-1P1, check the following pins.

PIN	MEASUREMENT	PASS/FAIL
1	+28 Vdc relative to ground	Pass: <input type="checkbox"/> Fail: <input type="checkbox"/> Initial: _____
2	<0.5 $\Omega$ to ground	Pass: <input type="checkbox"/> Fail: <input type="checkbox"/> Initial: _____
3	Voltage varies with PILOT INSTR LT dial	Pass: <input type="checkbox"/> Fail: <input type="checkbox"/> Initial: _____

b. On connector 9500-2P1, check the following pins.

PIN	MEASUREMENT	PASS/FAIL
1	+28 Vdc relative to ground	Pass: <input type="checkbox"/> Fail: <input type="checkbox"/> Initial: _____
2	<0.5 $\Omega$ to ground	Pass: <input type="checkbox"/> Fail: <input type="checkbox"/> Initial: _____
3	Voltage varies with COPLT INSTR LT dial	Pass: <input type="checkbox"/> Fail: <input type="checkbox"/> Initial: _____

9. Ensure the clock circuit breakers are pulled and collared.

10. Connect the clock connectors.

11. Remove collars and push in the clock circuit breakers.

12. Ensure the clocks are powered on.

13. Press and hold both "+" and "-" buttons for more than 2 seconds. After 2 seconds, ensure all display segments and annunciators shown in Figure 6 are activated until the buttons are released. Repeat for the other clock.



Figure 6 – Display Test (6420093-5 unit shown with USB-C connector)

14. Using appropriate cables, plug USB-charged devices (eg. personal phone, tablet) into both USB-A ports on one clock. Ensure that both devices indicate they are charging normally. Repeat for the other clock.
15. Adjust COPLT INSTR LT dial and ensure the copilot clock lighting changes accordingly. Repeat with the PILOT INSTR LT dial and pilot clock.
16. For the -011 configuration only, confirm flight timer functionality as follows:
  - a. Follow ICA-D212-725 96.6.7 to enable the engine hourmeter.
  - b. Pull up on the collective to close the collective switch installed as part of TBN-212-001.
  - c. Verify that the flight timers on both clocks are operating.
  - d. Lower the collective and complete ICA-D212-725 96.6.7 to remove testing provisions.
17. Perform EMI/EMC testing following the below steps. Refer to Table 6. For tests that include a frequency, test at the listed frequencies and at approximately one MHz intervals between the listed frequencies. For other radio systems with controllable frequencies, test in a similar manner for low, middle, and high frequency bands.
  - a. Ensure all systems are installed and functioning correctly. All previous steps in this section must be successfully completed before beginning EMI / EMC checks.
  - b. Ensure the aircraft is in a normal flight configuration. For example: all doors and windows are closed.
  - c. Using ground power, test each system outlined in Table 6 and record any aircraft abnormality that would indicate whether each system is a source or victim of EMI. Evaluate all possible scenarios and ensure that as many possible system settings are tested. Repeatedly perform tasks to ensure EMC (e.g., turn equipment on and off and adjust any user interfaces).
  - d. Using engine driven generators as the power source, complete testing of any systems that could not be tested on ground power (e.g., engine indications) and verify the evaluation performed in step c. Ensure that all systems are tested and any potential EMI that was noted is investigated further.
18. Turn off aircraft power and disconnect ground power in accordance with ICA-D212-725.

Aircraft Systems	EMI Source: Copilot Digital Clock/USB Charger		EMI Source: Pilot Digital Clock/USB Charger		EMI Victim: Copilot Digital Clock/USB Charger		EMI Victim: Pilot Digital Clock/USB Charger		Notes
	YES	NO	YES	NO	YES	NO	YES	NO	
VHF COMM 1, 118.000 MHz									
VHF COMM 1, 127.500 MHz									
VHF COMM 1, 135.975 MHz									
VHF COMM 2, 118.000 MHz									
VHF COMM 2, 127.500 MHz									
VHF COMM 2, 135.975 MHz									
NAV (VOR/ILS) NO. 1, 108.000 MHz									
NAV (VOR/ILS) NO. 1, 108.100 MHz									
NAV (VOR/ILS) NO. 1, 113.500 MHz									
NAV (VOR/ILS) NO. 1, 117.975 MHz									
NAV (VOR/ILS) NO. 2, 108.000 MHz									
NAV (VOR/ILS) NO. 2, 108.100 MHz									
NAV (VOR/ILS) NO. 2, 113.500 MHz									
NAV (VOR/ILS) NO. 2, 117.975 MHz									
GPS1									
GPS2									
PILOT AUDIO									
COPILOT AUDIO									
PUBLIC ADDRESS SYSTEM									
PILOT PFD/MFD									
COPILOT PFD/MFD									
ADAHRS 1									
ADAHRS 2									
HSVT									
STANDBY INSTRUMENT									
STANDBY COMPASS									
TCAS I									
RADIO ALTIMETER									
TRANSPONDER									
DME									
ELT									
GENERATOR / INVERTER									
EXTERIOR LIGHTS									
INTERIOR LIGHTS									
PUMPS / MOTORS									
PILOT TORQUE									
PILOT DUAL TACH									
COPILOT DUAL TACH									
NG									
MGT									
FUEL QUANTITY									
FUEL PRESSURE									
ENG OIL TEMP AND PRESS									
XMSN OIL TEMP AND PRESS									
HYD 1 OIL TEMP AND PRESS									
HYD 2 OIL TEMP AND PRESS									
GENERATOR VOLTMETER AND AMMETER									
MASTER CAUTION PANEL									
FIRE DETECTION AND WARNING									
OTHER:									
OTHER:									

Table 6 – EMI / EMC Check Sheet

## 5. Aircraft Record Set Update and Eagle Notification

1. Make an entry in the aircraft record set that TBN-212-002-011 or TBN-212-002-013 has been incorporated, as applicable.
2. Update the aircraft's Weight and Balance and Electrical Loads records with the values in Section 2 as required.
3. Notify Eagle Copters that TBN-212-002 Revision A has been incorporated by emailing the below information to [customersupport@eaglecopters.com](mailto:customersupport@eaglecopters.com):

Aircraft Serial Number

Aircraft Owner

Date Incorporated

Configuration Incorporated