

ATELIER INDUSTRIEL DE L'AERONAUTIQUE DE CUERS-PIERREFEU ----- DIVISION EQUIPEMENTS	<b>INSTRUCTION TECHNIQUE</b>	REFERENCE						Page 1 sur 41
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Désignation : vérin linéaire QFEEL

Ensemble supérieur ou aéronef : E2C

Niveau d'intervention possible : 3

Criticité : 2

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CONSTRUCTEUR	NUMEROS		OBSERVATIONS
	CONSTRUCTEUR	GESTION NOMENCLATURE OTAN	
HONEYWELL 70210	541928-1-1	1680-00-9476802	
HONEYWELL 70210	541928-2-1	1680-01-2933668	
GRUMMAN 26512	123SCC101-15	1680-01-2933668	

DOCUMENTS DE REFERENCES:

- NAVAIR 03-5CHA-59
- NAVAIR 03-5CHA-60
- NAVAIR 03-5CHA-75

DIFFUSION : 2424, 2720, original aux archives.

REDACTEUR :	VERIFICATEUR CHEF BT :	APPROBATEUR CHEF DE GROUPE BT DEQ
VISA	VISA	VISA
DATE	DATE	DATE

# **1 GENERALITES**

## **1.1 BUT DE L'EQUIPEMENT, ROLE A BORD, FONCTION DANS LE CIRCUIT**

Le système Q-FEEL a pour rôle de simuler les forces aérodynamiques exercées sur les gouvernes. Plus la vitesse sera élevée plus l'effort sur le manche pilote sera important

Le vérin Q-FEEL déplacera le point d'application des forces sur la timonerie

## **1.2 COMPOSITION ET DESCRIPTION DE L'EQUIPEMENT**

Ce vérin est constitué d'un moteur qui, par l'intermédiaire d'un réducteur, entraîne une vis sans fin. Cette vis sans fin entraîne en rotation le curseur d'un potentiomètre à 3 sorties:

- Recopie de la position du vérin vers l'indicateur Q - FEEL
- Asservissement du signal du SCADC qui est à l'origine de son déplacement
- Recopie de la position du vérin vers le Q - Feel Monitor Transducer

La vis sans fin entraîne également un chariot sur lequel sont montées des cames agissant sur des switches :

- Les 2 butées (rétraction et extension complète) qui coupent l'alimentation du vérin
- Les switches 7/16 in (vitesse supérieure à 150 nœuds)
- Les switches 1-3/16 in (ceux-ci ne sont pas utilisés sur l'E-2C)

## **1.3 CARACTERISTIQUES TECHNIQUES**

- Tension d'utilisation : 115 V 400 Hz
- Courant nominal à 159 Kg (350 Lbs) : 0,88 A max
- Courant saturation : 1 A
- Cycle de fonctionnement : continu à charge nominale et 21,1 ° C (70°F)
- Butée mécanique rentrée : 203,94 mm max (8.029 in)
- Butée mécanique sortie : 262,36 mm min (10,329 in)
- Butée électrique rentrée : 204,70 +- 0,13 mm (8,059 +- 0,005 in)
- Butée électrique sortie : 261,85 +- 0,13 mm (10,309 +- 0,005 in)
- Butée sens rétraction : switch ouvert jusqu'à 215,37 +- 0,13mm (8,479 +-0,005 in)
- Butée sens rétraction : switch fermé jusqu'à 215,37 mm + 0,13mm – 0,41 mm (8,479 +0,005 -0,026 in)
- Butée sens extension : switch ouvert jusqu'à 232,13 mm +- 0,13mm (8,479 +-0,005 in)
- Butée sens extension : switch fermé jusqu'à 232,13 mm + 0,13mm – 0,41 mm (8,479 +0,005 -0,016 in)
- Jeu axial sous 2,3 Kg : 0,18 mm max (0,007 in max)
- Poids : 1,13 Kg

### **3.3 BANCS D'ESSAIS ET APPAREILS DE MESURES**

#### **3.3.1 Bancs d'essais**

REFERENCE	DESIGNATION	OBSERVATION
1404TD961	Banc d'essai SODATEC	
VL515	Axe fixe	
VL525	Bague fixe	
VL513	Axe mobile	
VL523	Bague mobile	
AIAI33292004	Boîte d'essai	

#### **3.3.2 Appareils de mesures**

- Enregistreur graphique.
- [Pied à coulisse numérique à pointe 300 mm référence 552-204-50](#)

### **3.4 INGREDIENTS**

REFERENCE	DESIGNATION	OBSERVATIONS
ASOREL-B5L:FA1S6	solvant diélectrique	§5
S-737-B5L:F3005	alcool isopropylique dénaturé	§5
XS-850 :F3005	méthyl-ethyl-cetone	§5
ALODINE 1132 TOUCH-N-PREP:71410	Alodine	§6.2
XS-850:F3005	Dissolvant	§6.2.1
MMM-A-132:81348 Ou EC776 B.1L:F0347	Adhésif	§6.2.1 et §7.2.3
3M847-1L:F0347	Adhésif	§7.2.3
STYCAST2651:04552	Adhésif	§7.2.3
G-354-CG400G:F3005	Graisse	§7.1 et 7.2
TT-P-1757	Primaire	§7.1 (*)
MIL-C-8514	Peinture	§7.1 (*)

## **8 CONTROLE DES PERFORMANCES**

### **8.1 ESSAIS DES SOUS-ENSEMBLES**

Néant

### **8.2 ESSAIS DE L'ENSEMBLE ( [FIGURE 7](#) )**

#### **8.2.1 Isolement**

- Mesurer sous 250 V, la résistance d'isolement, au niveau de la prise entre les bornes A-B-C-W-Z et la masse :  $R \geq 50 \text{ M}\Omega$
- Mesurer sous 45 V, la résistance d'isolement, au niveau de la plaque à bornes entre toutes les autres bornes et la masse :  $R \geq 2 \text{ M}\Omega$

#### **8.2.2 Court-circuit**

- Potentiomètre « monitor output » bornes EFH
  - Vérifier l'absence de court-circuit entre les bornes E, F, H et la masse
- Potentiomètre « position feedback » bornes DJK
  - Vérifier l'absence de court-circuit entre les bornes D, J, K et la masse
- Potentiomètre « Ind output » bornes LMN
  - Vérifier l'absence de court-circuit entre les bornes L, M, N et la masse

#### **8.2.3 Contrôle des butées mécaniques**

- Interrupteur sur "rétraction"
  - appuyer sur le bouton poussoir "rentrée mécanique"
  - Amener le vérin jusqu'à qu'il se bloque en position mécanique rentrée et relever la longueur entraxe :  $\leq 203,94 \text{ mm} (\leq 8,029 \text{ in})$
- Interrupteur sur "extension"
  - Appuyer sur le bouton poussoir "sortie mécanique"
  - Amener le vérin jusqu'à qu'il se bloque en position mécanique sortie et relever la longueur entraxes :  $\geq 262,36 \text{ mm} (\geq 10,329 \text{ in})$

#### **8.2.4 Linéarité des potentiomètres**

- A l'aide de l'enregistreur graphique (ou équivalent), vérifier la linéarité des 3 potentiomètres : Bornes EFH, bornes DJK et bornes LMN.

#### **8.2.5 Vérin en butée électrique rentrée $204,70 \pm 0,13 \text{ mm} (8,059 \pm 0,005 \text{ in})$**

- Interrupteur sur "rétraction"
  - Appuyer sur le bouton poussoir "rentrée électrique"
  - Amener le vérin en butée électrique rentrée et vérifier la position  $204,57 \leq L \leq 204,83 \text{ mm}$
- Potentiomètre OUTPUT (EFH)
  - Bornes E-H :  $4500 \leq R \leq 5500 \Omega$
  - Bornes F-H :  $R < 10 \Omega$

- Potentiomètre FEEDBACK (DJK)
  - Bornes D-K :  $4500 \leq R \leq 5500 \Omega$
  - Bornes J-K :  $R < 10 \Omega$
- Potentiomètre IND OUTPUT (LMN)
  - Bornes L-N :  $196,98 \leq R \leq 205,02 \Omega$
  - Bornes M-N :  $5,5 \% \leq R \leq 11 \%$  de la valeur de L-N

### **8.2.6 Sens extension 215,37 +-0,13 mm (8,479 +- 0,005 in)**

Interrupteur sur "extension" et appuyer sur le bouton poussoir "sortie électrique"

- Amener le vérin en extension à la position  $215,24 \leq L \leq 215,5$  mm et vérifier que le changement d'état des switchs est dans la tolérance :
  - U - V : s'ouvre - voyant UV s'éteint (le changement d'état doit se faire dans la tolérance)
  - T - U : se ferme - voyant TU s'allume (le changement d'état doit se faire dans la tolérance)
- Potentiomètre MONITOR OUTPUT (EFH)
  - Mesurer E-H
  - Mesurer F-H
  - Rapport des résistances :  $0,17 \leq F-H \leq 0,22$
- Potentiomètre POSITION FEEDB AK (DJK)
  - Mesurer D-K
  - Mesurer J-K
  - Rapport des résistances :  $0,17 \leq J-K \leq 0,22$
- Potentiomètre IND OUTPUT (LMN)
  - Mesurer L-N
  - Mesurer M-N
  - Bornes M-N :  $21\% \leq R \leq 26,7 \%$  de la valeur de L-N

### **8.2.7 Sens extension 232,13 +-0,13 mm (9,139 +- 0,005 in)**

- Appuyer sur le bouton poussoir " sortie électrique"
- Amener le vérin en extension le vérin à la position  $232 \leq L \leq 232,26$  mm (T-U fermé et U-V ouvert) et vérifier :
  - Potentiomètre MONITOR OUTPUT (EFH)
    - Mesurer E-H
    - Mesurer F-H
    - Rapport des résistances :  $0,46 \leq E-H \leq 0,51$
  - Potentiomètre POSITIONFEEDB AK (DJK)
    - Mesurer DK

- Mesurer JK
- Rapport des résistances :  $0,46 \leq JK \leq 0,51$
- Potentiomètre IND OUTPUT (LMN)
  - Mesurer L-N
  - Mesurer M-N
  - Bornes M-N :  $45,4 \% \leq R \leq 51,1 \%$  de la valeur de L – N

#### **8.2.8 Sens extension 261,85 +-0,13 mm (10,309 +- 0,005 in)**

- Appuyer sur le bouton poussoir "sortie électrique"
- Amener le vérin en extension à la position  $261,72 \leq L \leq 261,98$  mm (T-U fermé et U-V ouvert) et vérifier :
  - Potentiomètre MONITOR OUTPUT (EFH)
    - Mesurer EH
    - Mesurer FH
    - Rapport des résistances :  $0,98 \leq EH \leq 1,00$
  - Potentiomètre POSITION FEEDB AK (DJK)
    - Mesurer DK
    - Mesurer JK
    - Rapport des résistances :  $0,98 \leq DK \leq 1,00$
  - Potentiomètre IND OUTPUT (LMN)
    - Mesurer L-N
    - Mesurer M-N
    - Bornes M-N :  $89,5 \% \leq R \leq 95 \%$  de la valeur de L – N

#### **8.2.9 Sens rétraction 232,13 +0,13 -0,41 mm (9,139 +0,005 -0,016 in)**

- Interrupteur sur "rétraction"
- Appuyer sur le bouton poussoir "rentrée électrique"
- Amener le vérin en rétraction à la position  $231,72 \leq L \leq 232,26$  mm (T-U fermé et U-V ouvert) et vérifier
  - Potentiomètre MONITOR OUTPUT (EFH)
    - Relever E-H
    - Mesurer F-H
    - Rapport des résistances :  $0,46 \leq FH \leq 0,51$
  - Potentiomètre POSITION FEEDB AK (DJK)
    - Relever D-K
    - Mesurer J-K
    - Rapport des résistances :  $0,46 \leq JK \leq 0,51$
  - Potentiomètre IND OUTPUT (LMN)

- Mesurer L-N
- Mesurer M-N
- Bornes M-N :  $45,2 \% \leq R \leq 51,1 \%$  de la valeur de L – N

#### **8.2.10 Sens rétraction 215,37 mm (8,479 +0,005-0,016 in)**

- Appuyer sur le bouton poussoir "rentrée électrique"
- Amener le vérin en rétraction à la position  $214,96 \leq L \leq 215,50$  mm et vérifier :
- Le changement d'état des switchs dans la tolérance :
  - U - V : se ferme - voyant UV s'allume (le changement d'état doit se faire dans la tolérance)
  - T - U : s'ouvre - voyant TU s'éteint (le changement d'état doit se faire dans la tolérance)
  - Potentiomètre MONITOR OUTPUT (EFH)
    - Relever E-H
    - Mesurer F-H
    - Rapport des résistances :  $0,17 \leq FH \leq 0,22$
  - Potentiomètre POSITION FEEDB AK (DJK)
    - Relever D-K
    - Mesurer J-K
    - Rapport des résistances :  $0,17 \leq JK \leq 0,22$
  - Potentiomètre IND OUTPUT (LMN)
    - Mesurer L-N
    - Mesurer M-N
    - Bornes m - n :  $21,5 \% \leq R \leq 26,7 \%$  de la valeur de L – N

#### **8.2.11 Position rétraction 204,7 +-0,13 mm (8,059 +-0,005 in)**

- Appuyer sur le bouton poussoir "rentrée électrique" jusqu'à la butée électrique rentrée et vérifier :
  - La position  $204,57 \leq L \leq 204,83$  mm
  - Potentiomètre MONITOR OUTPUT (EFH)
    - Bornes F-H :  $R < 10 \Omega$
  - Potentiomètre POSITION FEEDB AK (DJK)
    - Bornes J-K :  $R < 10 \Omega$
  - Potentiomètre IND OUTPUT (LMN)
    - Mesurer L-N
    - Mesurer M-N
    - Bornes M-N :  $5,5 \% \leq R \leq 11\%$  de la valeur de L – N

### **8.2.12 Essai en charge 160 Kg (350 lb)**

Interrupteur sur "extension"

- Appuyer sur le bouton poussoir "sortie électrique » et relever :
  - $23 \leq t \leq 35$  s
  - $\leq 0,88$  A

Interrupteur sur "rétraction"

- Appuyer sur le bouton poussoir "rentrée électrique" et relever :
  - $23 \leq t \leq 35$  s
  - $\leq 0,88$  A

### **8.2.13 Essai en surcharge 360 Kg (800 lb)**

Interrupteur sur "extension"

- Appuyer sur le bouton poussoir " sortie électrique" : fonctionnement correct

Interrupteur sur "rétraction"

- Appuyer sur le bouton poussoir "rentrée électrique" : fonctionnement correct

### **8.2.14 Glissement à vide**

- Extension :  $\leq 0,17$  mm (0,0068 in)
- Rétraction :  $\leq 0,17$  mm (0,0068 in)

### **8.2.15 Jeu axial**

- Exercer une force de 2,3 Kg longitudinale sur le vérin et relever le jeu axial  $\leq 0,18$  mm (0,007 in)

## **9 PANNES EVENTUELLES**

Pannes	Causes probables	Solutions
Le moteur ne marche pas, pas de courant	L'alimentation électrique défectueuse	Réparer l'alimentation
Le moteur de fonctionne pas sans charge ou fonctionne à vitesse réduite avec un courant excessif	Condensateur défectueux Epaisseur de peinture excessive entre le rotor et le stator Roulements défectueux Le frein reste collé	Remplacer le condensateur Retirer le surplus de peinture  Changer le roulement Remplacer le ou les éléments défectueux
Le moteur ne fonctionne que dans un sens	Epaisseur de peinture excessive entre le rotor et le stator Roulements défectueux Enroulement stator HS	Retirer le surplus de peinture  Changer le roulement Remplacer le stator
Courant excessif	Enroulement stator HS	Remplacer le stator
Le vérin ne fonctionne pas	L'alimentation électrique défectueuse Les fins de courses sont HS Le vérin est bloqué mécaniquement	Réparer l'alimentation Remplacer fins de courses Expertise interne

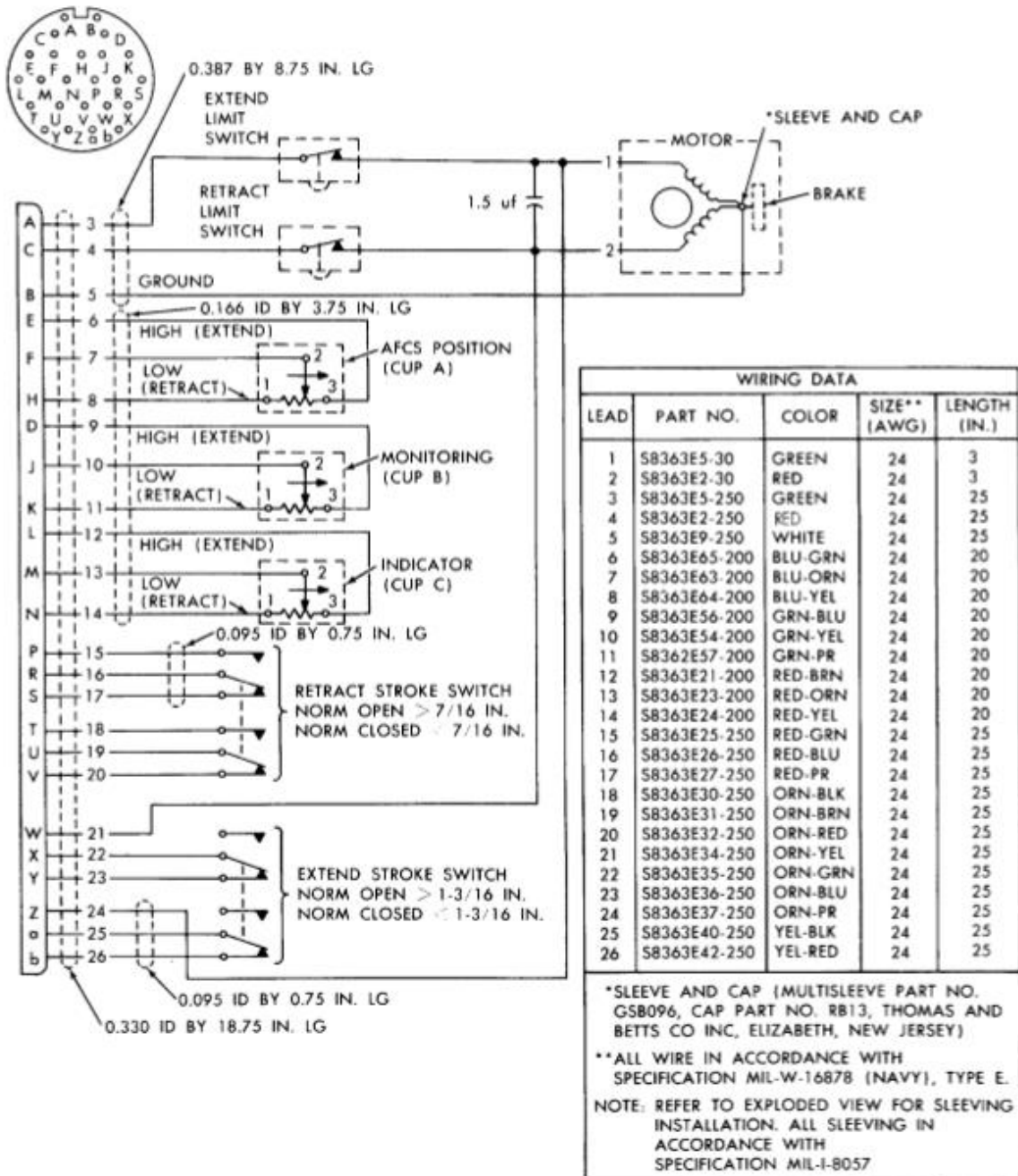
Pannes	Causes probables	Solutions
Le vérin ne fonctionne que dans un sens	Les fins de courses sont HS Moteur HS	Remplacer fins de courses Réparer moteur
Le vérin ne s'arrête pas	Fin de courses mal réglés Fin de courses HS	Reprendre le réglage Remplacer fin de courses
Le vérin est déréglé	Fin de courses mal réglés	Reprendre le réglage
Le vérin est trop lent et consomme trop	Vis linéaire/fourreau défectueux Train d'engrenages accroche Roulement défectueux Moteur HS	Remplacer Expertiser et réparer Changer le roulement Changer le moteur

## **10 TRAVAUX DE FINITION**

- Effectuer une peinture (PU66 blanche brillante) si nécessaire
- Vérifier le bon état extérieur.
- Vérifier les freinages
- Vérifier la présence et conformité des plaques signalétiques.
- Vérifier le bon état des rotules
- Mettre un bouchon de protection sur la prise.

## **11 PLANCHES ET FIGURES ANNEXES**

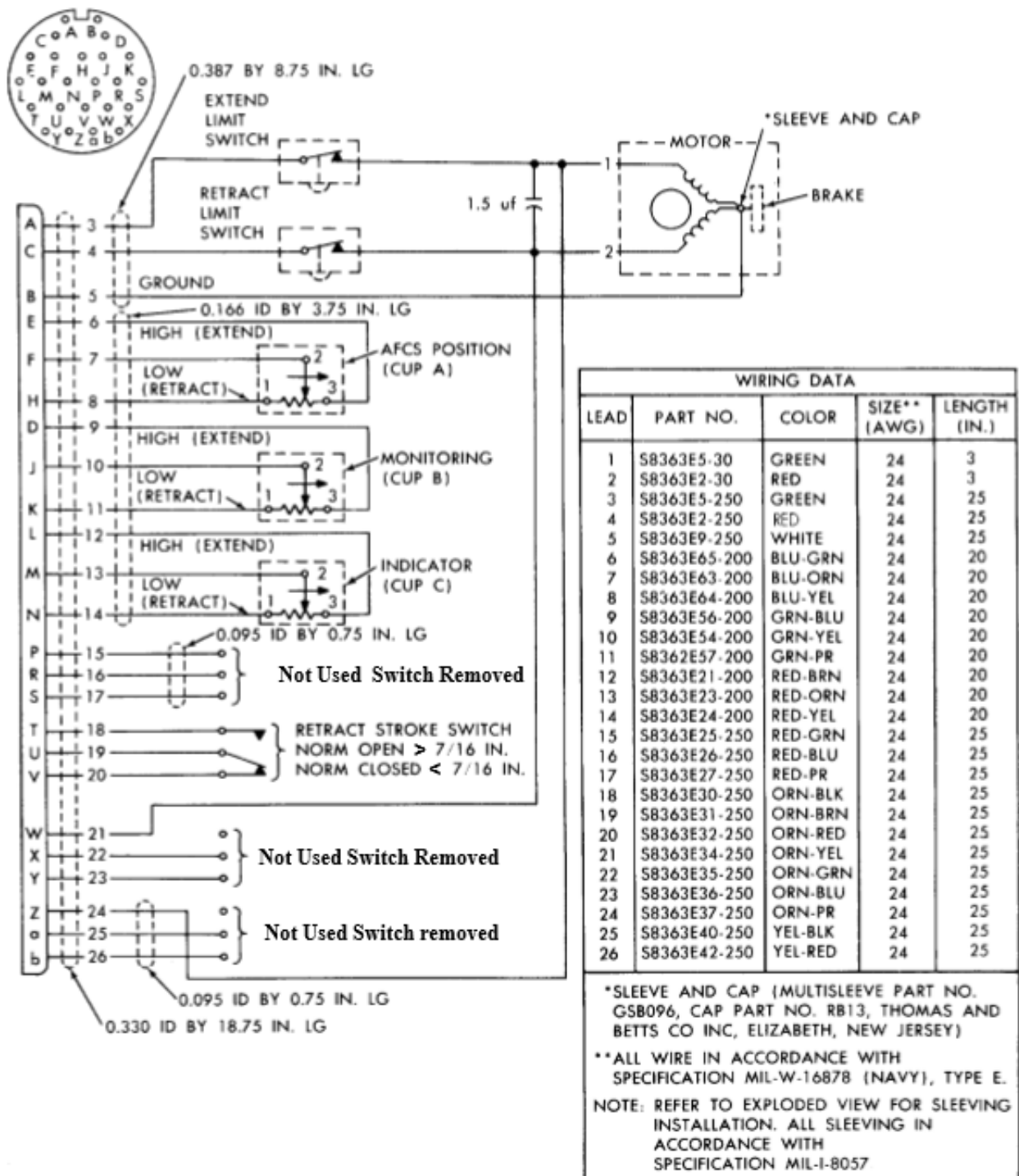
FIGURE 1 – SCHEMA ELECTRIQUE 541928-1-1



SCHA-59-3

Actuator 541928-1-1

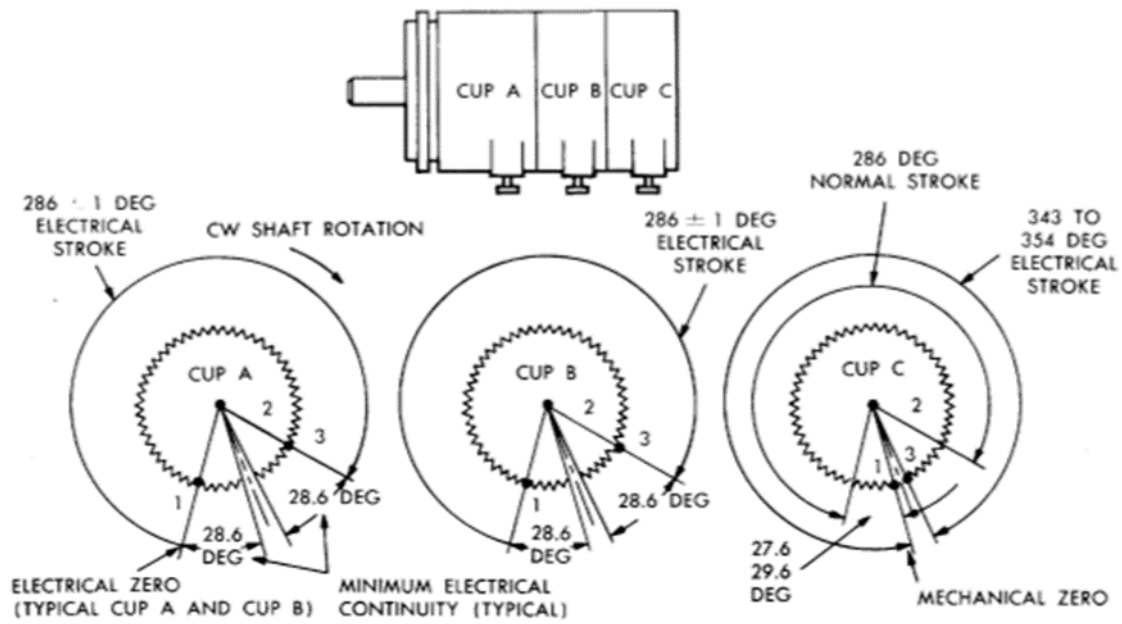
FIGURE 2 – SCHEMA ELECTRIQUE 541928-2-1



SCHA-59-3

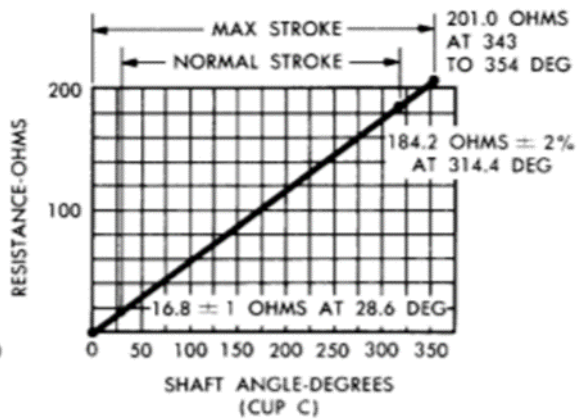
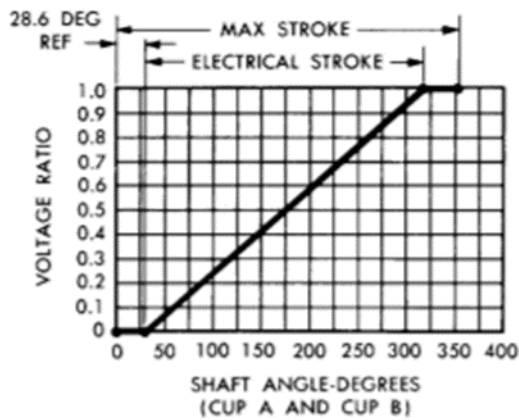
Actuator 541928-2-1

**FIGURE 3 – POTENTIOMETRE**



CHARACTERISTIC	CUP A	CUP B	CUP C
TOTAL RESISTANCE	5000 OHMS ± 10%	5000 OHMS ± 10%	201.1 OHMS ± 2%
MECHANICAL ROTATION	CONTINUOUS	CONTINUOUS	CONTINUOUS
LINEARITY (INDEPENDENT)	2.5%	2.5%	3.0%
*POWER RATING AT 200°F	1 WATT	1 WATT	1 WATT
RESOLUTION	WITHIN 0.2%	WITHIN 0.2%	NOT CRITICAL

\*DUTY CYCLE: 3 SEC ON, 4 SEC OFF FOR 1 MIN  
FOLLOWED BY 4 MIN OFF



SCHA-59-2

FIGURE 4 – VUE ECLATEE VERIN 541928-1-1

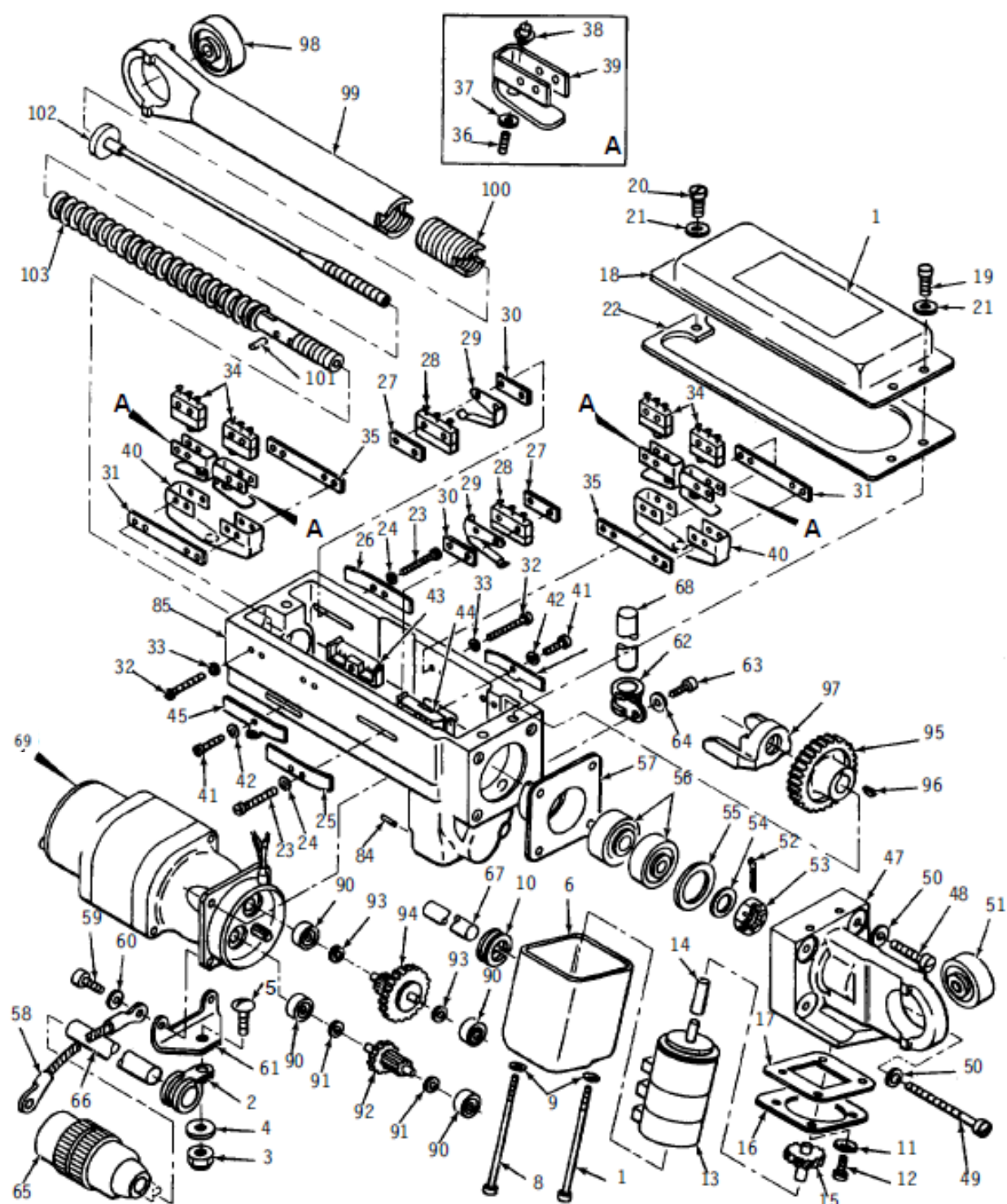
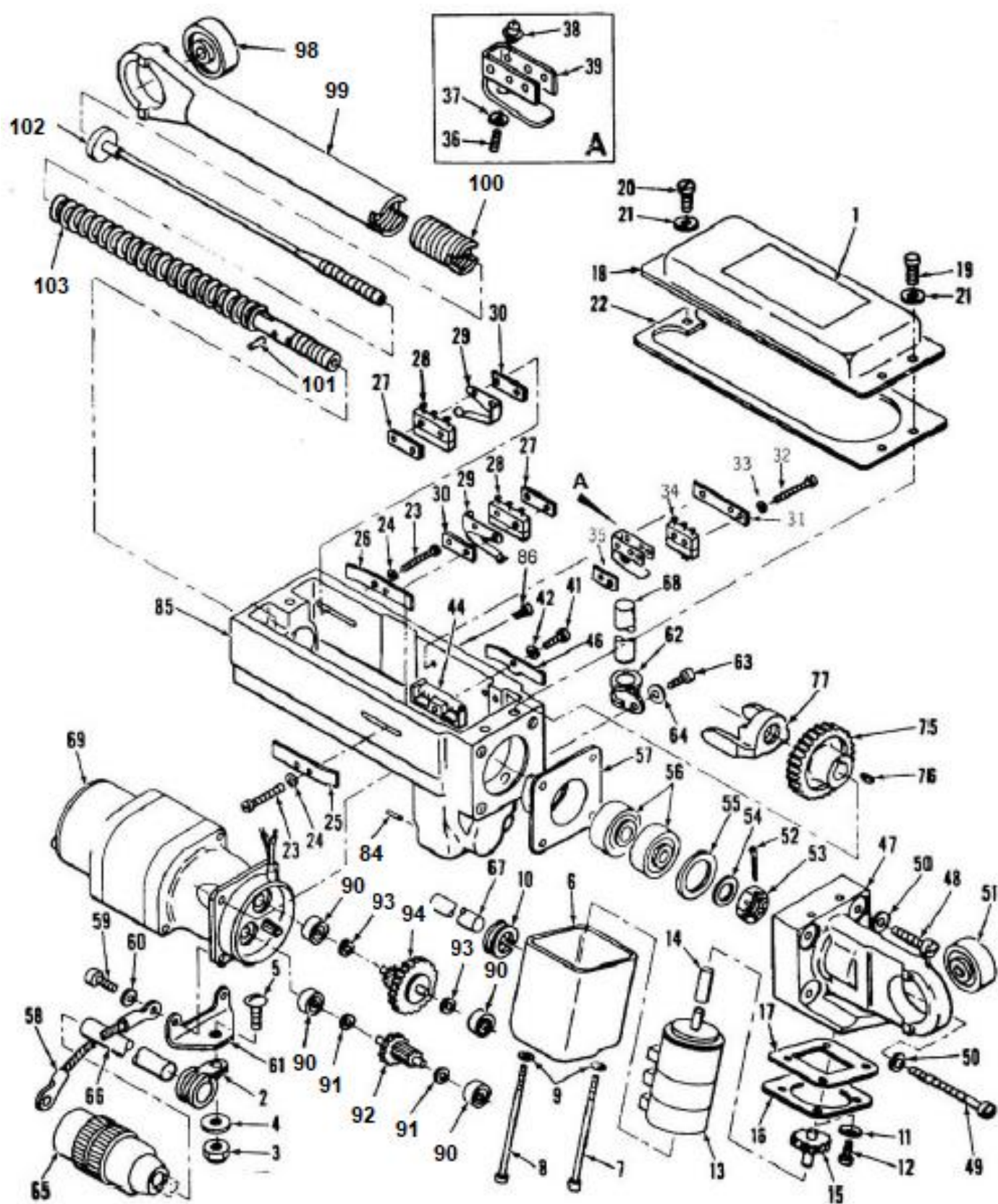


FIGURE 5 – VUE ECLATEE VERIN 541928-2-1



**FIGURE 6 – VUE ECLATEE MOTEUR**

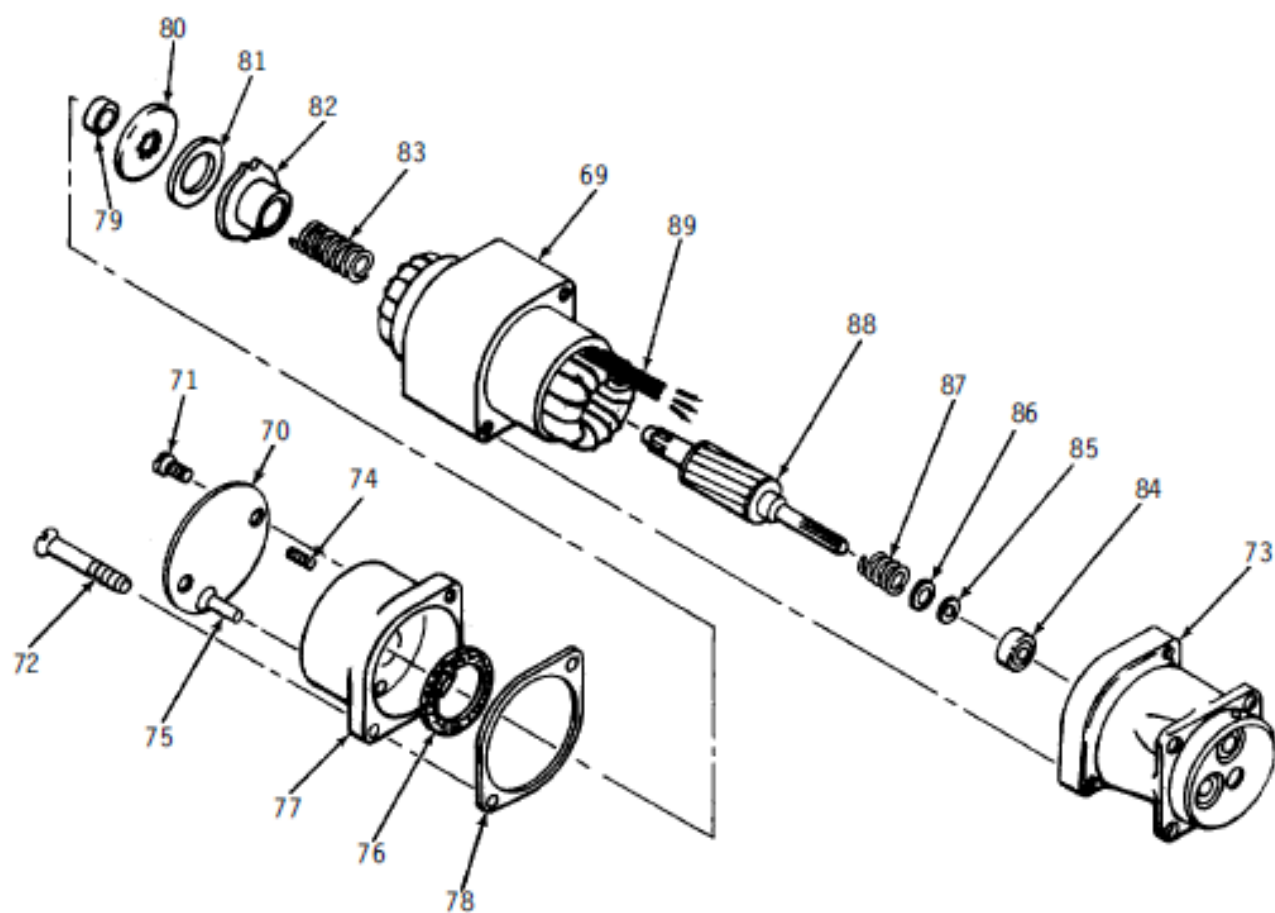
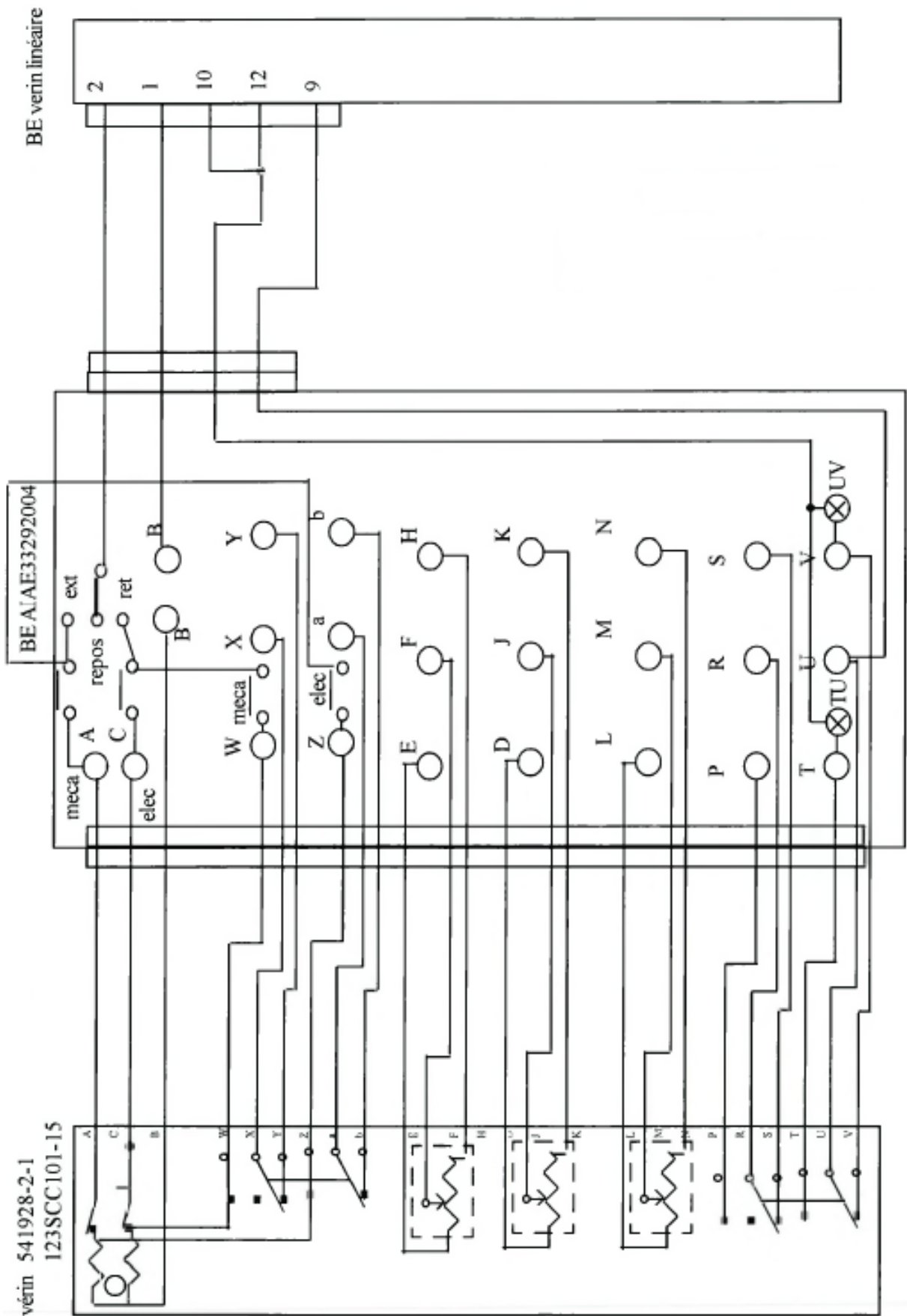


FIGURE 7 – MONTAGE D’ESSAI



<b>AIA CP</b> <b>****</b> <b>DEPARTEMENT DE</b> <b>LA QUALITE ET DU</b> <b>CONTROLE</b>	<b>PROCES-VERBAL DE CONTROLE</b>				<b>3</b>	<b>3</b>	<b>-</b>	<b>2</b>	<b>9</b>	<b>2</b>	Indice :	<b>E</b>
	Désignation de l'ensemble :	vérin linéaire QFEEL		N° SERIE	Approuvé par : <b>ROSSI Thierry</b>						F°	
	Désignation du sous-ensemble :			N° SERIE	Date : <b>08/04/2020</b>						Page 1 sur 11	

DESIGNATION				
REFERENCE ARTICLE :	<input type="checkbox"/> 541928-1-1	<input type="checkbox"/> 541928-2-1	<input type="checkbox"/> 123SCC101-15	<input type="checkbox"/>
N° DE GESTION	<b>1680-00-8476802</b>	<b>1680-01-2933668</b>	<b>16820-01-2933668</b>	
CONSTRUCTEUR	<b>HONEYWELL</b>	<b>HONEYWELL</b>	<b>NOR. GRUMMAN</b>	
AERONEF(S) OU SUPPORT :	<b>E2C</b>			
ITEM :				
N° OAE / N° DOSSIER INDUSTRIEL				
NIVEAU TECHNIQUE D'INTERVENTION *	<input type="checkbox"/> NTI2	<input type="checkbox"/> NTI3		
TYPE D'INTERVENTION *	<input type="checkbox"/> EP/TBF	<input type="checkbox"/>		
	<input type="checkbox"/> VP	<input type="checkbox"/>		
	<input type="checkbox"/> VMS	<input type="checkbox"/>		
	<input type="checkbox"/> TP2	<input type="checkbox"/>	<u>ESSAIS EFFECTUES</u>	LE
	<input type="checkbox"/> RE2	<input type="checkbox"/> RE3	PAR :	
	<input type="checkbox"/> MO2	<input type="checkbox"/> MO3	VISA :	
	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/>	<input type="checkbox"/>		
	<input type="checkbox"/> E2N	<input type="checkbox"/> E3N / RG		
*Cocher la case correspondante				

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Marque  
Date de contrôle :

<div>AIA CP</div> <div>****</div> <div>DEPARTEMENT DE LA QUALITE ET DU CONTROLE</div>	PROCES-VERBAL DE CONTROLE					3	3	-	2	9	2	Indice :	E
	Désignation de l'ensemble :      vérin linéaire QFEEL      N° SERIE										F°		
	Désignation du sous-ensemble :      N° SERIE										Page 2 sur 11		

LISTE RECAPITULATIVE DES EVOLUTIONS DEPUIS LA CREATION DU PVC				
	indice	Date d’approbation de la mise à jour	N° point de contrôle	Objet de l’évolution
	E			Mise à jour essais

Marque

Date de contrôle :

AIA CP **** DEPARTEMENT DE LA QUALITE ET DU CONTROLE	PROCES-VERBAL DE CONTROLE					3	3	-	2	9	2	Indice :	E
	Désignation de l'ensemble :      vérin linéaire QFEEL      N° SERIE										F°		
	Désignation du sous-ensemble :      N° SERIE										Page 3 sur 11		

	N°	POINT DE CONTROLE (§ DE L'IT)	CONSIGNE ET CONDITION DE CONTROLE	CRITERE DE CONTROLE	UNITES	RESULTAT	REPERE ECME	OBSERVATIONS
	1	§8.2.1 Isolement	Sous 250 V, entre A-B-C-W-Z et la masse Sous 45 V, entre toutes les bornes et la masse	$R \geq 50$ $R \geq 2$	MΩ MΩ	..... .....		
E E E	2	§8.2.2 Court-circuit	Bornes EFH et la masse Bornes DJK et la masse Bornes LMN et la masse	Absence de court-circuit Absence de court-circuit Absence de court-circuit	S/O S/O S/O	OK OK OK		
E E	3	§8.2.3 Butée mécanique	Rentrée Sortie	$\leq 203.94$ $\geq 262.36$	mm mm	..... .....		
	4	§8.2.4 Linéarité potentiomètres	- Bornes EFH - Bornes DJK - Bornes LMN	linéarité Linéarité linéarité	S/O S/O S/O	OK OK OK		

Marque

Date de contrôle :

<b>AIA CP</b> <b>****</b> <b>DEPARTEMENT DE</b> <b>LA QUALITE ET DU</b> <b>CONTROLE</b>	<b>PROCES-VERBAL DE CONTROLE</b>					<b>3</b>	<b>3</b>	<b>-</b>	<b>2</b>	<b>9</b>	<b>2</b>	Indice :	<b>E</b>
	Désignation de l'ensemble :      vérin linéaire QFEEL      N° SERIE										F°		
	Désignation du sous-ensemble :      N° SERIE										Page 4 sur 11		

	N°	POINT DE CONTROLE (§ DE L'IT)	CONSIGNE ET CONDITION DE CONTROLE	CRITERE DE CONTROLE	UNITES	RESULTAT	REPERE ECME	OBSERVATIONS
E	5	<b>§8.2.5 Butée électrique rentrée (8.059 +-0.005 in)</b>	Position rentrée 204.7 +-0.13 mm Potentiomètre OUTPUT (EFH) - Bornes E-H - Bornes F-H Potentiomètre FEEDBACK (DJK) - Bornes D-K - Bornes J-K Potentiomètre IND OUTPUT (LMN) - Bornes L-N - Bornes M-N	$204,57 \leq L \leq 204,83$  $4500 \leq R \leq 5500$ $R < 10$  $4500 \leq R \leq 5500$ $R < 10$  $196.88 \leq R \leq 205.02$ $5.5 \% \leq R \leq 11\% \text{ de LN}$	mm  $\Omega$ $\Omega$  $\Omega$ $\Omega$  $\Omega$ S/O	.....  ..... .....  ..... .....  ..... .....		T-U ouvert U-V fermé
	6	<b>§8.2.6 sens extension (8.479 +-0.005 in)</b>	Position 215.37 +-0.13 mm Switch 150 Kts - U-V - T-U Potentiomètre OUTPUT (EFH) - Relever EH - Mesurer FH - Ratio	  S'ouvre entre 215.24 et 215.5 Se ferme entre 215.24 et 215.5     $0.17 \leq \text{ratio} \leq 0.22$	  mm mm  $\Omega$ $\Omega$ S/O	  ..... .....  ..... ..... .....		

Marque  
Date de contrôle :

<b>AIA CP</b> <b>****</b> <b>DEPARTEMENT DE</b> <b>LA QUALITE ET DU</b> <b>CONTROLE</b>	<b>PROCES-VERBAL DE CONTROLE</b>					<b>3</b>	<b>3</b>	<b>-</b>	<b>2</b>	<b>9</b>	<b>2</b>	Indice :	<b>E</b>
	Désignation de l'ensemble :      vérin linéaire QFEEL      N° SERIE										F°		
	Désignation du sous-ensemble :      N° SERIE										Page 5 sur 11		

	N°	POINT DE CONTROLE (§ DE L'IT)	CONSIGNE ET CONDITION DE CONTROLE	CRITERE DE CONTROLE	UNITES	RESULTAT	REPERE ECME	OBSERVATIONS
	<b>6</b>	(suite)	Potentiomètre FEEBACK (DJK) - Relever DK - Mesurer JK - Ratio Potentiomètre IND OUTPUT (LMN) - Relever L-N - Mesurer M-N	$0.17 \leq \text{ratio} \leq 0.22$     $21 \% \leq \text{MN} \leq 26.7 \% \text{ de LN}$	$\Omega$ $\Omega$ S/O  $\Omega$ S/O	..... ..... .....  ..... .....		
	<b>7</b>	<b>§8.2.7 sens extension (9.139 +-0.005 in)</b>	Position 232.13 +-0.13 mm Potentiomètre OUTPUT (EFH) - Relever EH - Mesurer FH - Ratio Potentiomètre FEEBACK (DJK) - Relever DK - Mesurer JK - Ratio	$232 \leq L \leq 232,26$    $0.46 \leq \text{ratio} \leq 0.51$   $0.46 \leq \text{ratio} \leq 0.51$	mm   $\Omega$ $\Omega$ S/O  $\Omega$ $\Omega$ S/O	.....   ..... ..... ..... ..... .....		T-U fermé U-V ouvert

Marque  
 Date de contrôle :

<b>AIA CP</b> <b>****</b> <b>DEPARTEMENT DE</b> <b>LA QUALITE ET DU</b> <b>CONTROLE</b>	<b>PROCES-VERBAL DE CONTROLE</b>					<b>3</b>	<b>3</b>	<b>-</b>	<b>2</b>	<b>9</b>	<b>2</b>	Indice :	<b>E</b>
	Désignation de l'ensemble : vérin linéaire QFEEL N° SERIE										F°		
	Désignation du sous-ensemble : N° SERIE										Page 6 sur 11		

	N°	POINT DE CONTROLE (§ DE L'IT)	CONSIGNE ET CONDITION DE CONTROLE	CRITERE DE CONTROLE	UNITES	RESULTAT	REPERE ECME	OBSERVATIONS
	<b>7</b>	<b>(suite)</b>	Potentiomètre IND OUTPUT (LMN) - Relever L-N - Mesurer M-N	$45.4 \% \leq MN \leq 51.1 \% \text{ de LN}$	$\Omega$ S/O	..... .....		
	<b>8</b>	<b>§8.2.8 sens extension (10.309 +- 0.005 in)</b>	Position 261.85 +-0.13 mm Potentiomètre OUTPUT (EFH) - Relever EH - Mesurer FH - Ratio Potentiomètre FEEBACK (DJK) - Relever DK - Mesurer JK - Ratio Potentiomètre IND OUTPUT (LMN) - Relever L-N - Mesurer M-N	$261.72 \leq L \leq 261.98$   $0.98 \leq \text{ratio} \leq 1$   $0.98 \leq \text{ratio} \leq 1$	mm  $\Omega$ $\Omega$ S/O $\Omega$ $\Omega$ S/O $\Omega$ S/O	..... ..... ..... ..... ..... ..... ..... .....		T-U fermé U-V ouvert

<b>Marque</b> <b>Date de contrôle :</b>
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<div>AIA CP</div> <div>****</div> <div>DEPARTEMENT DE LA QUALITE ET DU CONTROLE</div>	PROCES-VERBAL DE CONTROLE			3	3	-	2	9	2	Indice :	E
	Désignation de l'ensemble :	vérin linéaire QFEEL	N° SERIE							F°	
	Désignation du sous-ensemble :		N° SERIE							Page 7 sur 11	

	N°	POINT DE CONTROLE (§ DE L'IT)	CONSIGNE ET CONDITION DE CONTROLE	CRITERE DE CONTROLE	UNITES	RESULTAT	REPERE ECME	OBSERVATIONS
	9	<b>§8.2.9 sens rétraction (9.139 + 0.005-0.016 in)</b>	Position 232,13 +0,13 -0,41 mm  Potentiomètre OUTPUT (EFH)  - Relever EH  - Mesurer FH  - Ratio  Potentiomètre FEEBACK (DJK)  - Relever DK  - Mesurer JK  - Ratio  Potentiomètre IND OUTPUT (LMN)  - Relever L-N  - Mesurer M-N	$231.72 \leq L \leq 232.26$          $0.46 \leq \text{ratio} \leq 51$          $0.46 \leq \text{ratio} \leq 051$          $45.4 \% \leq MN \leq 51.1 \% \text{ de LN}$	mm    $\Omega$  $\Omega$  S/O  $\Omega$  $\Omega$  S/O  $\Omega$  S/O	.....    .....  .....  .....  .....  .....  .....  .....  .....		T-U fermé U-V ouvert
	10	<b>§8.2.10 sens rétraction (8.479 + 0.005-0.016 in)</b>	Position 215.37 +0.13 – 0.41mm  Switch 150 Kts  - U-V  - T-U	   Se ferme entre 214.96 et 215.50  S'ouvre entre 214.96 et 215.50	   mm  mm	.....  .....		

<b>Marque</b> <b>Date de contrôle :</b>
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<b>AIA CP</b> <b>****</b> <b>DEPARTEMENT DE</b> <b>LA QUALITE ET DU</b> <b>CONTROLE</b>	<b>PROCES-VERBAL DE CONTROLE</b>					<b>3</b>	<b>3</b>	<b>-</b>	<b>2</b>	<b>9</b>	<b>2</b>	Indice :	<b>E</b>
	Désignation de l'ensemble : vérin linéaire QFEEL N° SERIE										F°		
	Désignation du sous-ensemble : N° SERIE										Page 8 sur 11		

	N°	POINT DE CONTROLE (§ DE L'IT)	CONSIGNE ET CONDITION DE CONTROLE	CRITERE DE CONTROLE	UNITES	RESULTAT	REPERE ECME	OBSERVATIONS
	<b>10</b>	<b>(suite)</b>	Potentiomètre OUTPUT (EFH) - Relever EH - Mesurer FH - Ratio Potentiomètre FEEBACK (DJK) - Relever DK - Mesurer JK - Ratio Potentiomètre IND OUTPUT (LMN) - Relever L-N - Mesurer M-N	   $0.17 \leq \text{ratio} \leq 0.22$      $0.17 \leq \text{ratio} \leq 0.22$      $21 \% \leq \text{MN} \leq 26.7 \% \text{ de LN}$	   $\Omega$ $\Omega$ S/O  $\Omega$ $\Omega$ S/O  $\Omega$ S/O	   ..... ..... .....  ..... ..... .....  ..... .....		
E	<b>11</b>	<b>§8.2.11 sens rétraction (8.059 +- 0.005in)</b>	Position rentrée 204.7 +-0.13 mm Potentiomètre OUTPUT (EFH) - Bornes E-H - Bornes F-H Potentiomètre FEEBACK (DJK) - Bornes D-K - Bornes J-K	 $204,57 \leq L \leq 204,83$  $4500 \leq R \leq 5500$ $R < 10$  $4500 \leq R \leq 5500$ $R < 10$	 mm  $\Omega$ $\Omega$  $\Omega$ $\Omega$	 .....  ..... .....  ..... .....		T-U ouvert U-V fermé
E								

Marque  
 Date de contrôle :

<b>AIA CP</b> <b>****</b> <b>DEPARTEMENT DE</b> <b>LA QUALITE ET DU</b> <b>CONTROLE</b>	<b>PROCES-VERBAL DE CONTROLE</b>					<b>3</b>	<b>3</b>	<b>-</b>	<b>2</b>	<b>9</b>	<b>2</b>	Indice :	<b>E</b>
	Désignation de l'ensemble :      vérin linéaire QFEEL      N° SERIE										F°		
	Désignation du sous-ensemble :      N° SERIE										Page 9 sur 11		

	N°	POINT DE CONTROLE (§ DE L'IT)	CONSIGNE ET CONDITION DE CONTROLE	CRITERE DE CONTROLE	UNITES	RESULTAT	REPERE ECME	OBSERVATIONS
	<b>11</b>	<b>(suite)</b>	Potentiomètre IND OUTPUT (LMN) - Bornes L-N - Bornes M-N	$5.5 \% \leq R \leq 11\% \text{ de LN}$	$\Omega$ S/O	..... .....		
	<b>12</b>	<b>§8.2.12 essai en charge 158.8 Kg (350 lb)</b>	Extension Consommation Rétraction consommation	$23 \leq t \leq 35$ $\leq 0.88$ $23 \leq t \leq 35$ $\leq 0.88$	S A S A	..... ..... ..... .....		
	<b>13</b>	<b>§8.2.13 essai en surcharge 362.9 Kg (800 lb)</b>	Extension Rétraction	Fonctionnement correct Fonctionnement correct	S/O S/O	..... .....		
	<b>14</b>	<b>§8.2.14 glissement à vide</b>	Extension Rétraction	$\leq 0.17$ $\leq 0.17$	mm mm	..... .....		
	<b>15</b>	<b>§8.2.15 jeu axial</b>	Sous 2.3 Kg	$\leq 0.18$	mm	.....		
E	<b>16</b>	<b>§ 10 contrôle final</b>	bon état extérieur		S/O	OK		
E			Bon état des freinages		S/O	OK		
E			Présence et conformité de la plaque signalétique		S/O	OK		
E			Bon état des rotules		S/O	OK		
E			Bouchon de protection sur la prise		S/O	OK		

**Marque**

**Date de contrôle :**

<div>AIA CP</div> <div>****</div> <div>DEPARTEMENT DE LA QUALITE ET DU CONTROLE</div>	<div>PROCES-VERBAL DE CONTROLE</div>					<div>3</div>	<div>3</div>	<div>-</div>	<div>2</div>	<div>9</div>	<div>2</div>	<div>Indice :</div>	<div>E</div>
	Désignation de l'ensemble :      vérin linéaire QFEEL      N° SERIE												
	Désignation du sous-ensemble :      N° SERIE												

ETAT DES EVOLUTIONS								
Type Aéronef / équipement								
N° Modif. Avion								
Date								
N° Modif. Equipement								
Date								
N° BT Avion								
Date								
N° BT Equipement								
Date								
Amendement								
Date								
Marquage								
Code								
CODE A UTILISER								
Marquage : Inscription portée sur le matériel ou <div></div> si aucun marquage n'est prévu								
N° mod°	<div>8</div>	<div>8</div>	<div>8</div>	<div>8</div>	<div>8</div>	<div>8</div>	<div>8</div>	
ou								
n° BT								
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NTL Code								
	Mod 8	Mod 8	Mod 8	Mod 8	Mod 8	Mod 8	Mod8	
	Non appliquée	appliquée partiellement	déjà appliquée	appliquée	annulée		non applicable	

<div>Marque</div> <div>Date de contrôle :</div>
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<div>AIA CP</div> <div>****</div> <div>DEPARTEMENT DE LA QUALITE ET DU CONTROLE</div>	<div>PROCES-VERBAL DE CONTROLE</div>			<div>3</div>	<div>3</div>	<div>-</div>	<div>2</div>	<div>9</div>	<div>2</div>	<div>Indice :</div>	<div>E</div>
	Désignation de l'ensemble :      vérin linéaire QFEEL      N° SERIE								F°		
	Désignation du sous-ensemble :      N° SERIE								Page 11 sur 11		

Métrologie					
Rep E.C.M.E	N° MET/TRACK-E.C.M.E.	DATE DE FIN DE VALIDITE	Rep E.C.M.E	N° MET/TRACK-E.C.M.E.	DATE DE FIN DE VALIDITE

ENREGISTREMENT EFFECTUE PAR

VISA

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<div>Marque</div> <div>Date de contrôle :</div>
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**NAVAIR 03-5CHA-59**

**1 May 2007**

**Change 1 – 1 July 2010**

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**TECHNICAL MANUAL**

**OVERHAUL INSTRUCTIONS**

**DEPOT LEVEL MAINTENANCE**

**ELECTROMECHANICAL LINEAR ACTUATOR**

**PART NO.**  
**541928-1-1**  
**and**  
**541928-2-1**

This Change incorporates IRACs 1 and 2.  
Basic publication and all changes have been collated to make this a complete publication.

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## NUMERICAL INDEX OF EFFECTIVE WORK PACKAGES/PAGES

### List of Current Changes

Original 0 ..... 1 May 2007      Change 1 ..... 1 July 2010  
 Incorp. IRACs 1 and 2

Only those work packages/pages assigned to the manual are listed in this index. Insert Change 1, dated 1 July 2010. Dispose of superseded and deleted work packages/pages. Superseded and deleted classified work packages/pages shall be destroyed in accordance with applicable regulations. If changed pages are issued to a work package, insert the changed pages in the applicable work package. The portion of text affected in a changed or revised work package is indicated by change bars or the change symbol "R" in the outer margin of each column of text. Changes to illustrations are indicated by pointing hands or change bars, as applicable.

WP Number	Title	WP Number	Title
Title		001 00	Introduction
Page A	Numerical Index of Effective Work Packages/Pages	002 00	Overhaul Instructions
TPDR	Technical Publications	003 00	Test Procedure
	Deficiency Reports Incorporated		

The total number of pages in this manual is 26, consisting of the following:

WP/Page No.	Change No.	WP/Page No.	Change No.	WP/Page No.	Change No.
Title .....	1	001 00		003 00	
Page A .....	1	1 – 2 .....	0	1 – 4 .....	1
TPDR-1 .....	1	002 00		5 (Added) .....	1
TPDR-2 Blank .....	1	1 – 14 .....	1	6 Blank (Added) .....	1

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**LIST OF TECHNICAL PUBLICATION DEFICIENCY REPORTS INCORPORATED**

**DEPOT LEVEL MAINTENANCE**

**OVERHAUL INSTRUCTIONS**

**ELECTROMECHANICAL LINEAR ACTUATOR**

**PARTS NO. 5419281-1 AND 5419282-1**

**This TPDR page supersedes TPDR page dated 1 May 2007**

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Identification No./  
QA Sequence No.

Location

None



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**INTRODUCTION****DEPOT LEVEL MAINTENANCE****ELECTROMECHANICAL LINEAR ACTUATOR****Part Numbers 5419281-1 and 541928-2-1**

---

**1. GENERAL.**

2. This technical manual provides overhaul and test instructions for Electromechanical Linear Actuator, Part Nos. 541928-1-1 and 541928-2-1, manufactured by The Garrett Corporation, AiResearch Manufacturing Division, Los Angeles, California. The actuator is shown in Figure 1.

**3. PURPOSE.**

4. The actuator converts electrical energy into me-

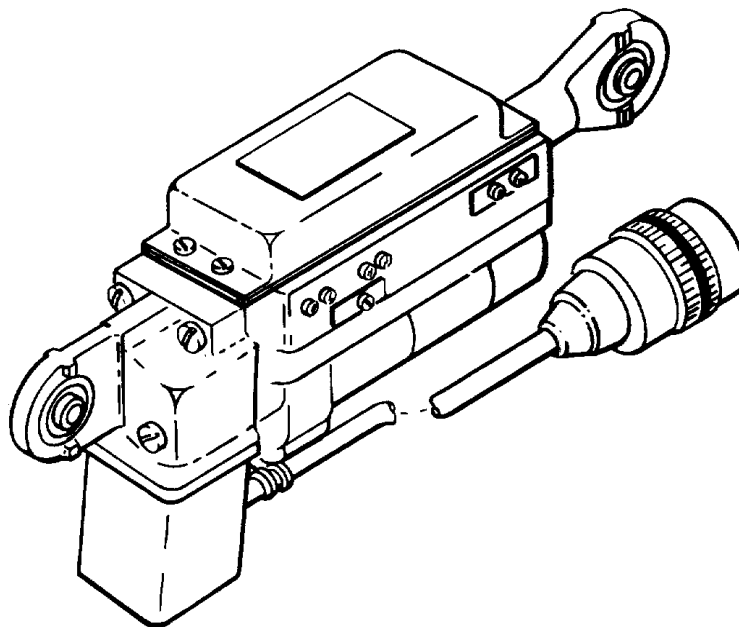
chanical linear movement.

**5. LEADING PARTICULARS.**

6. Leading particulars for the actuator are given in Table 1.

**7. CONTENTS.**

8. Work Packages 2 and 3 of this technical manual contain overhaul and test instructions, respectively, for Electromechanical Linear Actuator, Part Nos. 541928-1-1 and 541928-2-1.



**Figure 1. Electromechanical Linear Actuator, Part Nos. 541928-1-1 and 541928-2-1**

Table 1. Leading Particulars

Operating voltage . . . . .	115 volts ac at 400 Hz	AFCS position cup of variable resistor:	
Operating current (at 350 lb load) . .	0.88 amp (max)	Pin E . . . . .	High (extend)
Stall current . . . . .	1.0 amp	Pin F . . . . .	Wiper
Duty cycle . . . . .	continuous at rated load and 21.1° C (70° F)	Pin H . . . . .	Low (retract)
Retracted length to mechanical stops* . . . . .	8.029 in (max.)	Monitoring cup of variable resistor:	
Extended length to mechanical stops* . . . . .	10.329 in (min.)	Pin D . . . . .	High (extend)
Retracted length to limit switch setting* . . . . .	8.059 ± 0.005 in.	Pin J . . . . .	Wiper
Extended length to limit switch setting* . . . . .	10.309 ± 0.005 in.	Pin K . . . . .	Low (retract)
Retract stroke switch:		Indicator cup of variable resistor:	
Normally open (above) . . . . .	8.479 ± 0.010 in.	Pin L . . . . .	High (extend)
Normally closed (below) . . . . .	8.479 + 0.005/ - 0.026 in.	Pin M . . . . .	Wiper
Extended stroke switch:		Pin N Low (retract)	
Normally open (above) . . . . .	9.139 ± 0.005 in.	Retract stroke switch:	
Normally closed (below) . . . . .	9.139 + 0.005 -0.016 in.	Pin P . . . . .	Normally open
Operating load:		Pin R . . . . .	Common
Rated output . . 350 lb at 0.08 in per sec + 20%		Pin S . . . . .	Normally closed
Maximum operating load (tension or compression) . . . . .	1500 lb (max)	Pin T . . . . .	Normally open
Ambient operating temperature		Pin U . . . . .	Common
Range . . . . .	-54° to 93° C (-65° to 200° F)	Pin V . . . . .	Normally closed
Electrical connections:		Extend stroke switch:	
Electric motor:		Pin W . . . . .	Normally open
Pin A . . . . .	Extend (pos)	Pin X . . . . .	Common
Pin B . . . . .	Ground (neg)	Pin Y . . . . .	Normally Closed
Pin C . . . . .	Retract (pos)	Pin Z . . . . .	Normally open
		Pin a . . . . .	Common
		Pin b . . . . .	Normally closed
		Weight . . . . .	2.5 lb (approx)
		Axial Rod End Play . . . . .	0.007 in max with 5lb reversal load applied

\*Measured from centerlines of end cap and rod-end connector bearing eyes.

## OVERHAUL INSTRUCTIONS

## ELECTROMECHANICAL LINEAR ACTUATOR

Part Numbers 541928-1-1 and 541928-2-1

This WP supersedes WP 002 00 dated 1 May 2007

**1. SPECIAL TOOLS AND TEST EQUIPMENT.**

2. Special tools and test equipment required to overhaul the actuator are listed in Table 1.

**3. DISASSEMBLY.**

4. Disassemble in the sequence of index numbers assigned to figure 1. observing the following:

a. Do not remove plate (1) unless required after inspection.

**CAUTION**

Do not cut electrical leads. Leads will be too short for reassembly when cut.

b. Unsolder electrical leads only as required for disassembly. Tag and identify all electrical leads to aid in reassembly.

c. Do not disassemble gearshaft (15). coupling (14), and resistor (13) unless required after inspection.

d. Do not disassemble gear assembly (72). If either part of these assemblies does not meet inspection requirements, the entire assembly must be replaced.

e. Use 278053 Bearing Puller, or equivalent, if required, to remove bearings (51, 56, 70).

f. Disassemble motor (69) in sequence of index numbers assigned to figure 1, in accordance with steps g through i.

g. Do not remove pins (6) from end bell assembly (8) unless required after inspection.

h. Do not remove lining (12) from armature (13) or lining (7) from end bell assembly (8) unless required after inspection.

i. Use 278053 Bearing Puller or equivalent, if required, to remove bearings (10, 15).

**Table 1. Special Tools and Test Equipment**

Part Number	Manufacturer	Noun Name	Key to Text
271206	The Garrett Corp. AiResearch Mfg. Corp. Los Angeles, Calif.	Gap Adjuster- Motor Brake	WP 002 00 Para. 18e
278053	The Garrett Corp. AiResearch Mfg. Corp. Los Angeles, Calif.	Puller – Mechanical Bearing	WP 002 00 Para. 4e, 4i
257916-1	The Garrett Corp. AiResearch Mfg. Corp. Los Angeles, Calif.	Electric Power Test Set	WP 003 00 Para. 4a
253724	The Garrett Corp. AiResearch Mfg. Corp. Los Angeles, Calif.	Motor Test Dynamometer	WP 003 00 Para. 4h

5CHA-60-1

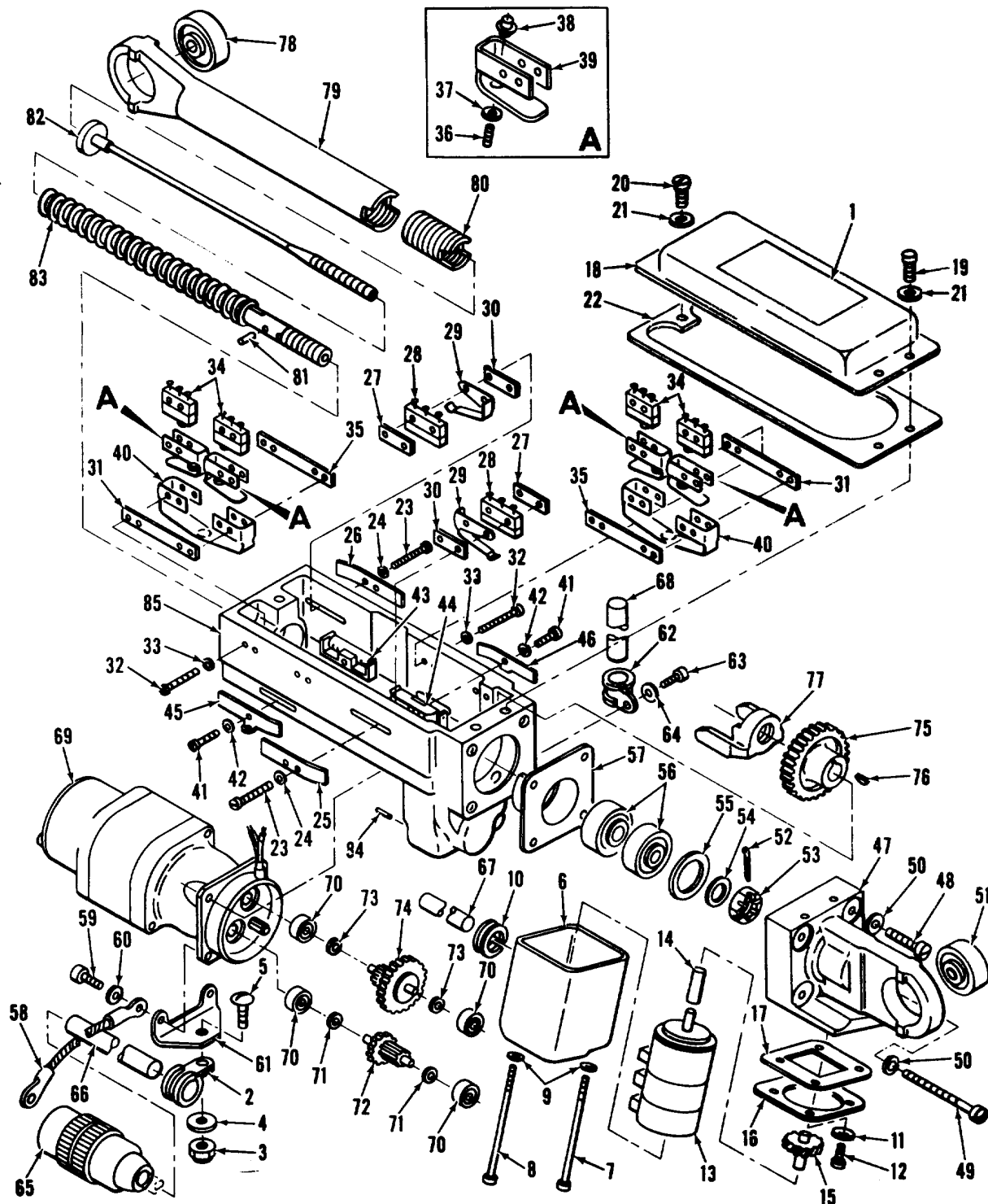


Figure 1. Electromechanical Linear Actuator, 541928-1-1 Exploded View (Sheet 1 of 3)

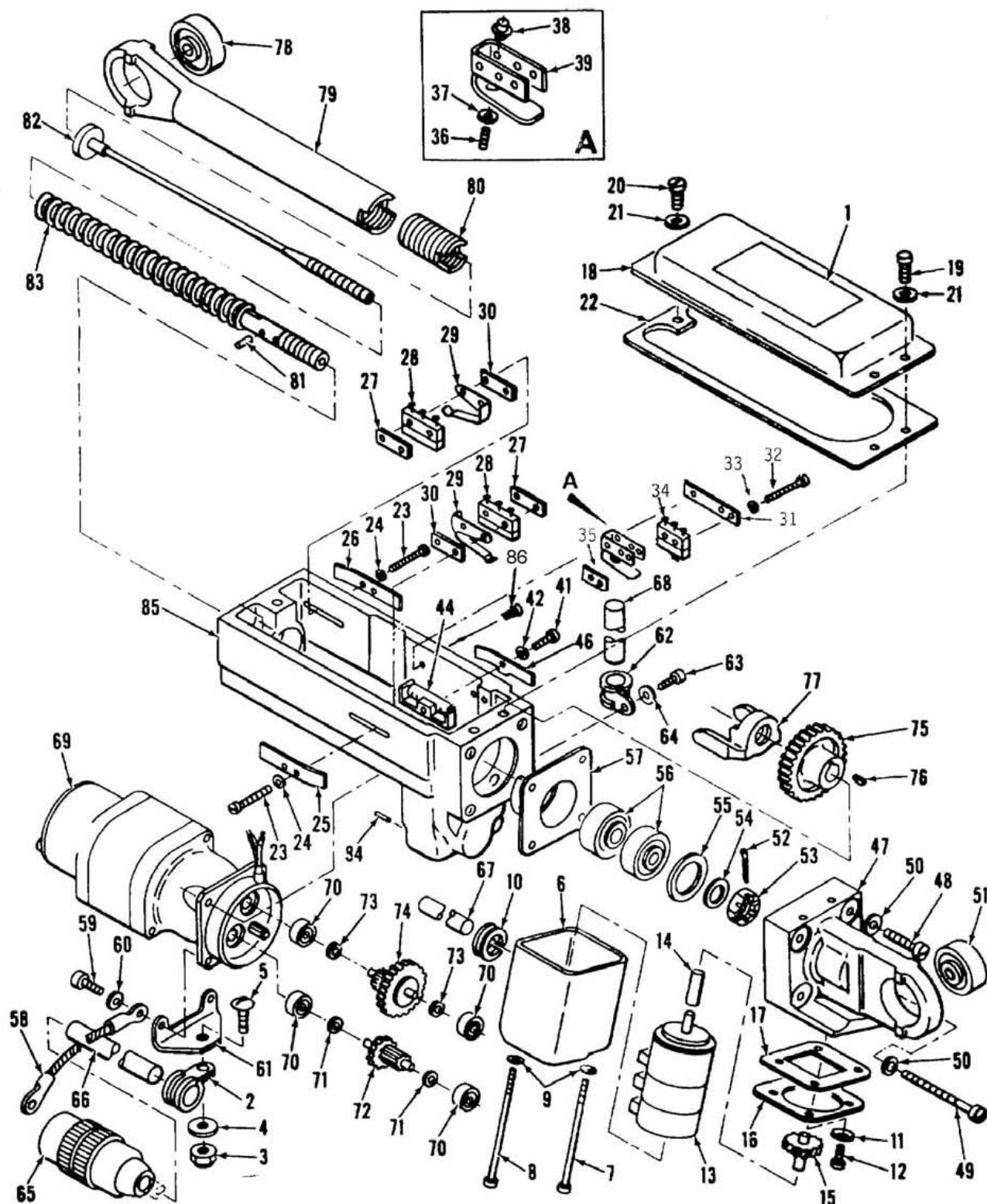
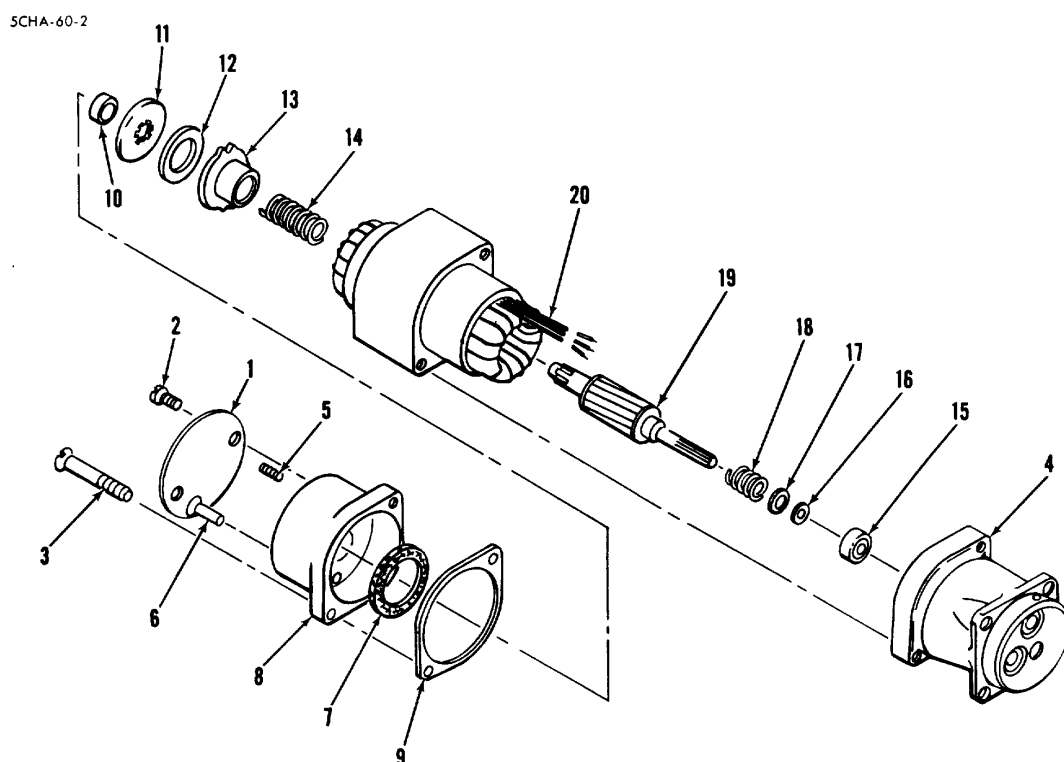


Figure 1. Electromechanical Linear Actuator, 541928-2-1 Exploded View (Sheet 2)

1. Plate	29. Actuator	57. Retainer
2. Clamp	30. Lockplate	58. Jumper Assembly
3. Nut	31. Spacer	59. Screw
4. Washer	32. Screw	60. Washer
5. Screw	33. Washer	61. Bracket
6. Cover	34. Switch	62. Clamp
7. Screw	35. Spacer	63. Screw
8. Screw	36. Setscrew	64. Washer
9. Washer	37. Washer	65. Connector
10. Grommet	38. Nut	66. Sleeving
11. Clamp	39. Adapter	67. Sleeving
12. Screw	40. Bracket	68. Sleeving
13. Resistor	41. Setscrew	69. Motor
14. Coupling	42. Washer	70. Bearing
15. Gearshaft	43. Door Assembly	71. Washer
16. Plate	44. Door Assembly	72. Gear Assembly
17. Gasket	45. Plate	73. Washer
18. Capacitor	46. Plate	74. Gear Assembly
19. Screw	47. End Cap	75. Spur Gear
20. Screw	48. Screw	76. Key
21. Washer	49. Screw	77. Follow-Up Nut
22. Cover	50. Washer	78. Bearing
23. Screw	51. Bearing	79. Connector
24. Washer	52. Pin	80. Power nut
25. Plate	53. Nut	81. Pin
26. Plate	54. Washer	82. Torque Bar
27. Lockplate	55. Washer	83. Jackscrew
28. Switch	56. Bearing	84. Pin
		85. Housing
		86. Rivet

**Figure 1. Electromechanical Linear Actuator, Exploded View (Sheet 3)**



1. Plate	6. Pin	11. Disk	16. Washer
2. Screw	7. Lining	12. Lining	17. Washer
3. Screw	8. End Bell Assembly	13. Armature	18. Spring
4. End Bell Assembly	9. Washer	14. Spring	19. Rotor Assembly
5. Screw	10. Bearing	15. Bearing	20. Stator Assembly

**Figure 2. Alternating-Current Motor, Part No. 516021-4-1, Exploded View**

## 5. CLEANING.

6. To clean the disassembled actuator, proceed as follows:

### **WARNING**

Use dry-cleaning solvent and methyl-ethyl-ketone in a well-ventilated area. Avoid breathing fumes. Avoid skin contact with methyl-ethyl-ketone. Keep away from flame. Do not direct compressed air against skin.

### **Note**

Cleaning of used parts is required before inspection is performed. Parts which will be replaced by a new component need not be cleaned.

a. Wash all nonelectrical parts, except bearings (51, 56, and 70, figure 1, and 10, 15, figure 2), with dry-cleaning solvent, Federal Specification P-D-680, or equivalent, and dry thoroughly with a clean, lint-free cloth or with compressed air. Remove cement deposits from sealed mating surfaces and tapped holes with methyl-ethyl-ketone, Federal Specification TT-M-00261C or ASTM D 740.

b. Wipe electrical parts with a clean cloth, lightly moistened with dry-cleaning solvent. Dry thoroughly. Clean electrical contacts on connector (65, figure 1) with a soft, nonmetallic, bristle brush.

c. Make certain that all passages and holes are clean and unobstructed and that grooves, channels, and slots are free of hardened accumulations.

## 7. INSPECTION.

8. Perform the following general inspections. Replace parts as required.

a. Inspect threaded areas for crossed or nicked threads.

b. Inspect all machined surfaces for cracks, nicks, scratches, and corrosion.

c. Inspect all gears for nicks, chipped teeth, and deep wear patterns.

d. Inspect painted surfaces for damage and deterioration.

e. Inspect for broken wires and inspect wiring for loose, missing, and deteriorated insulation.

9. Perform the following detail inspections on actuator (figure 1).

a. Inspect housing (85) for damage.

b. Inspect plate (1) for security and legibility.

c. Inspect dry-film lubricated surfaces of gearshaft (15), gear assemblies (72 and 74), spurgear (75), follow-up nut (77), and jackscrew (83) for scratches, scores, corrosion, and wear through to bare metal. Check that no more than 20% of base metal is exposed.

d. Inspect shaft of resistor (13), outside diameter shall be concentric with outside diameter of mounting flange on shaft end of case and normal to mounting surface within 0.001 inch total indicator reading. Torque required to start shaft rotation shall not exceed 2.0 ounce-inches.

e. Inspect capacitor (18, figure 1) for leaking potting compound and for loose, broken, or missing terminals.

f. If present, inspect switches (28, 34) for condition of cases and terminals.

g. Inspect bearings (51, 56, 70) thoroughly. Bearings shall not be rusted, discolored, fractured, or have worn surfaces. Bearings shall rotate smoothly without roughness or binding.

h. Inspect bearing bore in end cap (47); bore shall be smooth and normal to mounting surface of cap within 0.0005 inch per inch.

i. Inspect threads of follow-up nut (77), power nut (80), and jackscrew (83) for chips, nicks, and damage. Thread jackscrew into follow-up nut and power nut; nuts shall traverse jackscrew smoothly, with no binding or drag.

j. Inspect chrome plating on connector (79); plating shall not be worn through.

k. Inspect torque bar (82) for security of button and for straightness; torque bar shall be straight within 0.02 inch over entire length.

10. Perform the following detail inspection on motor (69, figure 1).

a. Inspect identification plate (1, figure 2) for legibility.

b. Inspect insert in end bell assembly (4) for security and wear. Bore diameter shall not exceed 0.3757 inch.

c. Inspect pins (6) for security in end bell assembly (8) and freedom of damage caused by movement of armature (13).

d. Check measurement from braking surface of lining (7) to mounting surface of end bell assembly (8); measurement shall not exceed 0.569 inch.

e. Inspect insert in end bell assembly (8) for security and wear. Bore diameter shall not exceed 0.370 inch.

f. Inspect disk (11) for scores and distortion. Braking surface finish shall be 20 microinches RMS, or better, and anodic coating shall not be worn through. When disk is placed on the surface plate, disk shall be flat within 0.0005 inch; any evidence of distortion is cause for rejection. Check that spline is not damaged and that disk moves freely on shaft of rotor assembly (19).

g. Inspect copper plating on armature (13) for wear. Check that notches which ride on pins (6) are free of burrs or wear which might cause sticking on pins. Over-all length, including lining (12), shall not be less than 0.365 inch.

h. Check springs (14, 18) for distortion by rolling springs across a flat surface.

i. Inspect rotor assembly (19) for nicked, chipped, or broken splines. Inspect major diameter for evidence of scraping. Inspect rotor assembly shaft for straightness; shaft bearing diameters and drive end of shaft shall be concentric with major diameter of rotor assembly.

bly within 0.0005 inch total indicator reading. Inspect shaft bearing diameters for wear. Shaft diameter on drive shaft end shall not be less than 0.1243 inch, and on opposite end less than 0.1249 inch.

j. Inspect stator assembly (20) for evidence of scraping on inside diameter.

## 11. TESTING.

12. Test actuator components as follows:

a. Using insulation tester LC53 (SENCORE) or equivalent, apply approximately 416 volts at 60 Hz between terminals of capacitor (18, figure 1) for 1 minute; then, apply 600 volts at 60 Hz between terminals and capacitor case for 1 second; capacitance shall be 1.35 to 1.65 microfarads. Any evidence of insulation breakdown is cause for rejection.

b. Using a continuity checker, check switches (28, 34) for make or break.

c. Test resistor (13) for conformance with requirements of figure 3.

13. Test motor components as follows:

a. Measure resistance of each winding on stator assembly (20, figure 2). Resistance between red and white lead wires and between green and white lead-wires shall be the same within 10% of the higher value. Refer to figure 4.

b. Check insulation of stator assembly (20), using a suitable AC dielectric tester. Apply 1,500 volts at 60 Hz between both white leadwires and stator assembly for 1 second. Apply 1,500 volts between red and green lead-wires, keeping white leadwires separated. Any evidence of insulation breakdown is cause for rejection.

## 14. REPAIR. OR REPLACEMENT.

a. Replace all parts that are damaged beyond repair or fail to meet inspection or test requirements.

b. Replace grommet (10, figure 1), gasket (17), screw (20), and screw (5, figure 2) regardless of condition.

c. Remove minor scratches, burrs, and corrosion from steel parts with crocus abrasive cloth, Federal Specification **A-A-1206**. On aluminum parts, use fine aluminum oxide or silicone carbide abrasive cloth Federal Specification **A-A-1200** or **A-A-1048**. Clean all parts thoroughly after rework. Touch up repaired surfaces of aluminum alloy parts with chemical film meeting requirements of Specification **MIL-C-5541**.

## CAUTION

Do not use crocus abrasive cloth, Federal Specification **A-A-1206**, on aluminum parts. Crocus abrasive cloth contains an oxide of iron which causes rapid corrosion of aluminum.

d. If resistor (13, figure 1), coupling (14) and gear-shaft (15) require disassembly, dissolve adhesive, using Epoxy Dissolver TC523, manufactured by Chemical Div., Electronic Production and Development Inc., Hawthorne, California, or equivalent (no military specification available) prior to separating parts. Coat inside diameter of coupling (14) with adhesive GP **MMM-A-1617B** Type III, or equivalent, and assemble parts. Distance between face of resistor (13) and face of gear on gearshaft (15) shall be 0.783 to 0.793 inch. Ensure adhesive on coupling (14) and gearshaft (15) is fully cured before assembling onto resistor (13).

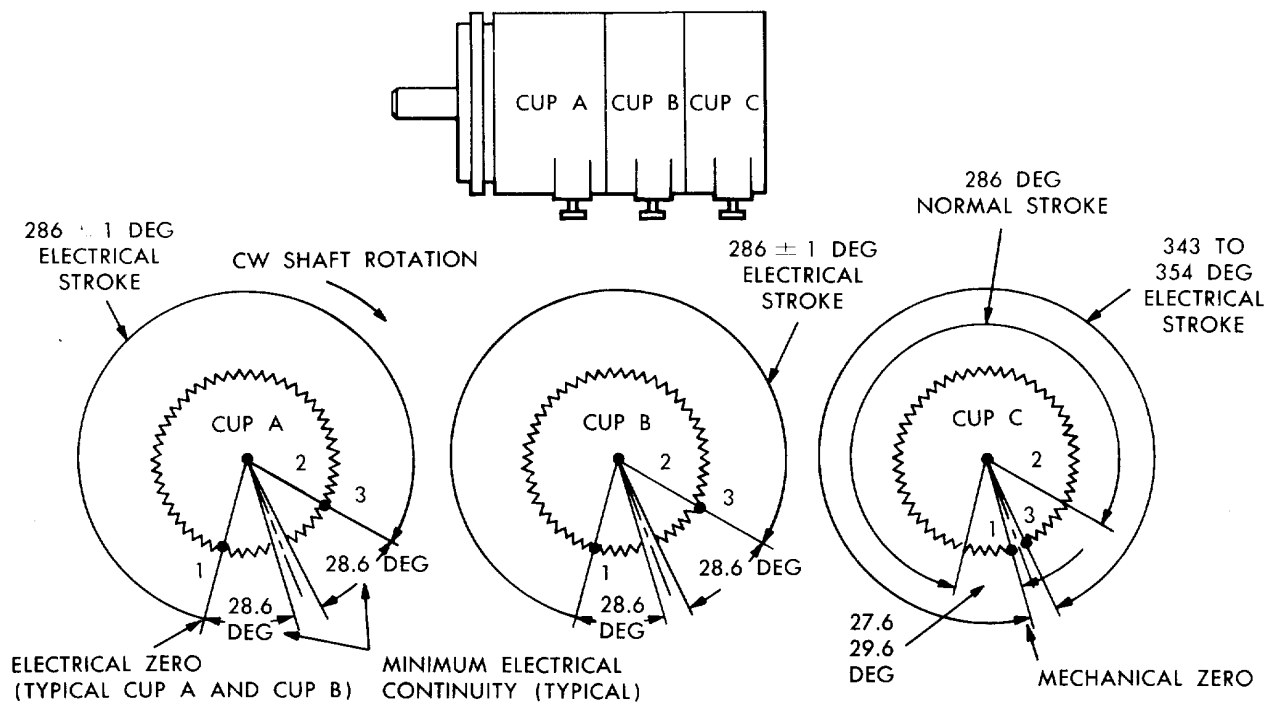
## WARNING

Use epoxy dissolver, adhesive, and activator in a well-ventilated area. Avoid breathing fumes. If activator, or mixed adhesive and activator come in contact with skin, wash immediately with soap and water.

e. If more than 20 percent of base metal is exposed on lubricated gearshaft (15), gear assemblies (72 and 74), spur gear (75), follow up nut (77), or jackscrew (83), replace with **MIL-L-23699** or equivalent, to a thickness of 0.0001 to 0.0003 inch for gear surfaces, and 0.0003 to 0.0005 inch for follow-up nut and jackscrew.

f. If bearings (51) require replacement, clean and lubricate bearings with 0.25 to 0.35 gram of grease, Specification **MIL-G-23827**. Press in bearings and circular stake eight places to secure.

g. If painted surfaces require repair, mask unpainted areas to protect from sanding residue and new paint and remove defective paint with fine abrasive paper, Federal Specification **P-P-00101** or **A-A-1047**, Grit No. 320; then, clean thoroughly. Apply one coat of primer, Specification **MIL-C-8514** (AER) and allow to air-dry for at least 1/2 hour. Apply 1 coat of zinc chromate primer, Specification **TT-P-1757** (AER) and allow to air-dry for at least 1 hour. Apply 2 coats of insignia white gloss enamel, Specification **MIL-E-7729A-1**, **ANA Color No. 511**, in accordance with Federal Standard **FED-STD-595**. Allow each coat to air dry for 1 hour.



CHARACTERISTIC	CUP A	CUP B	CUP C
TOTAL RESISTANCE	5000 OHMS ± 10%	5000 OHMS ± 10%	201.1 OHMS ± 2%
MECHANICAL ROTATION	CONTINUOUS	CONTINUOUS	CONTINUOUS
LINEARITY (INDEPENDENT)	2.5%	2.5%	3.0%
*POWER RATING AT 200°F	1 WATT	1 WATT	1 WATT
RESOLUTION	WITHIN 0.2%	WITHIN 0.2%	NOT CRITICAL

\*DUTY CYCLE: 3 SEC ON, 4 SEC OFF FOR 1 MIN  
FOLLOWED BY 4 MIN OFF

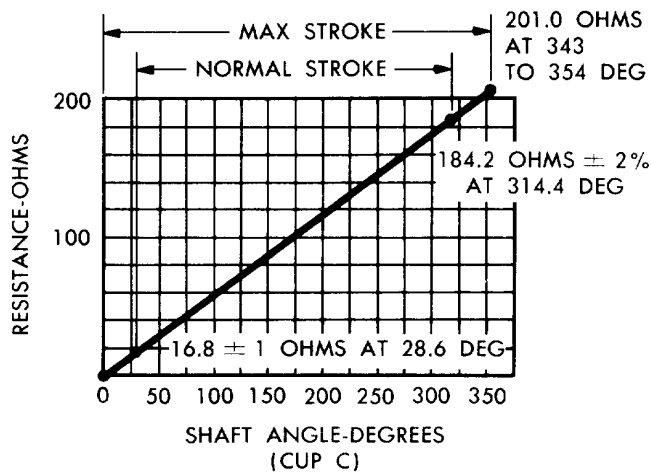
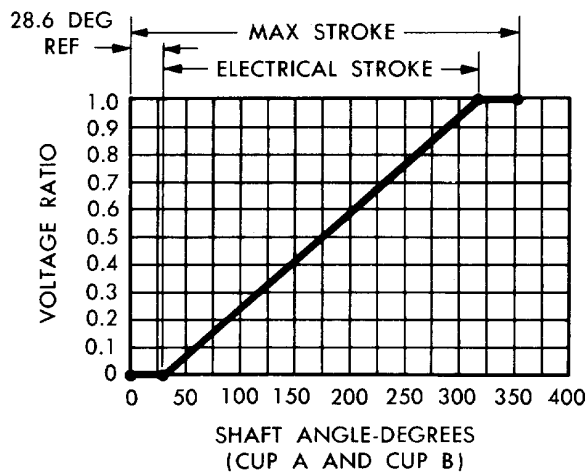
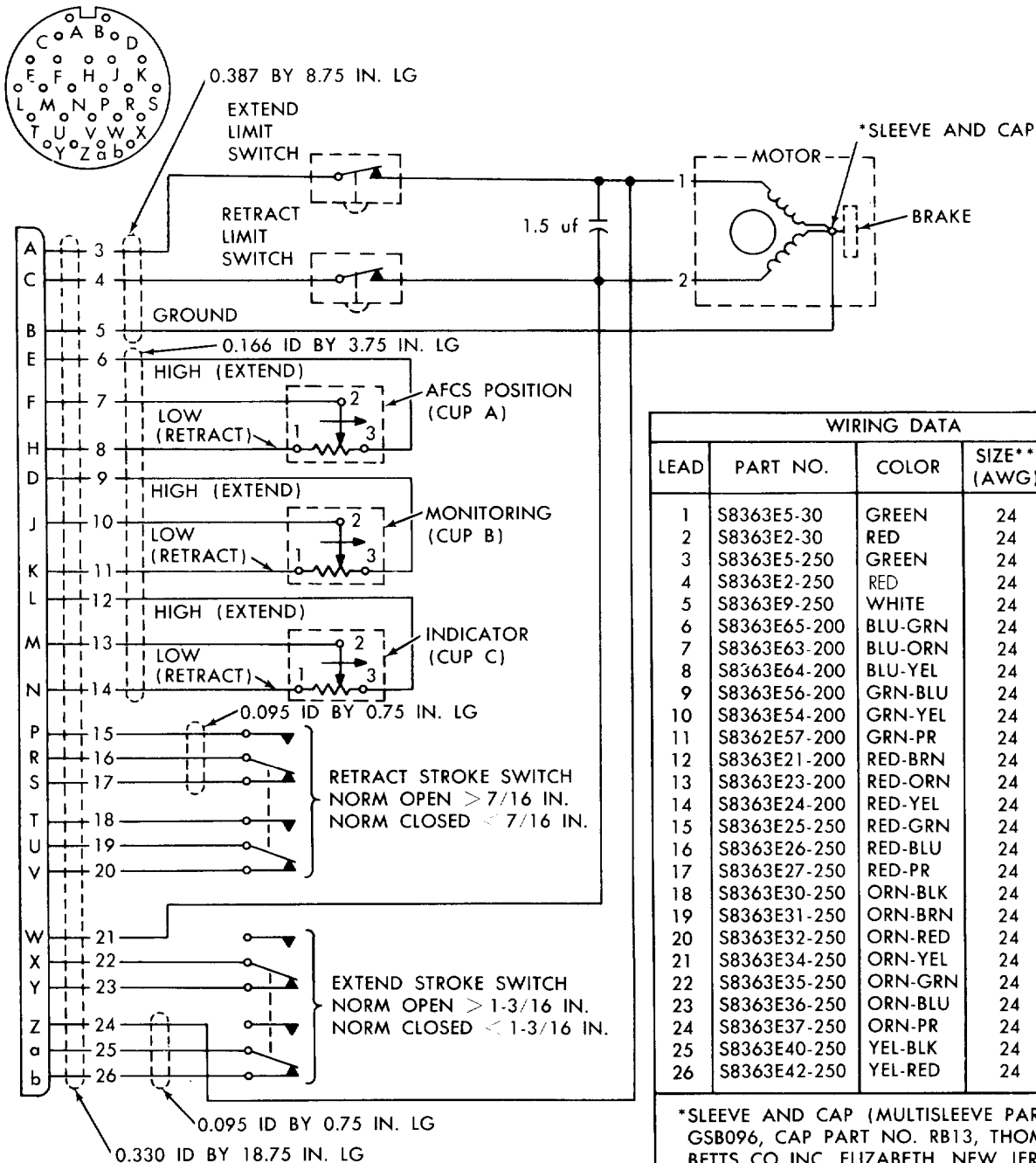


Figure 3. Resistor Inspection Data



WIRING DATA				
LEAD	PART NO.	COLOR	SIZE** (AWG)	LENGTH (IN.)
1	S8363E5-30	GREEN	24	3
2	S8363E2-30	RED	24	3
3	S8363E5-250	GREEN	24	25
4	S8363E2-250	RED	24	25
5	S8363E9-250	WHITE	24	25
6	S8363E65-200	BLU-GRN	24	20
7	S8363E63-200	BLU-ORN	24	20
8	S8363E64-200	BLU-YEL	24	20
9	S8363E56-200	GRN-BLU	24	20
10	S8363E54-200	GRN-YEL	24	20
11	S8362E57-200	GRN-PR	24	20
12	S8363E21-200	RED-BRN	24	20
13	S8363E23-200	RED-ORN	24	20
14	S8363E24-200	RED-YEL	24	20
15	S8363E25-250	RED-GRN	24	25
16	S8363E26-250	RED-BLU	24	25
17	S8363E27-250	RED-PR	24	25
18	S8363E30-250	ORN-BLK	24	25
19	S8363E31-250	ORN-BRN	24	25
20	S8363E32-250	ORN-RED	24	25
21	S8363E34-250	ORN-YEL	24	25
22	S8363E35-250	ORN-GRN	24	25
23	S8363E36-250	ORN-BLU	24	25
24	S8363E37-250	ORN-PR	24	25
25	S8363E40-250	YEL-BLK	24	25
26	S8363E42-250	YEL-RED	24	25

\*SLEEVE AND CAP (MULTISLEEVE PART NO. GSB096, CAP PART NO. RB13, THOMAS AND BETTS CO INC, ELIZABETH, NEW JERSEY)

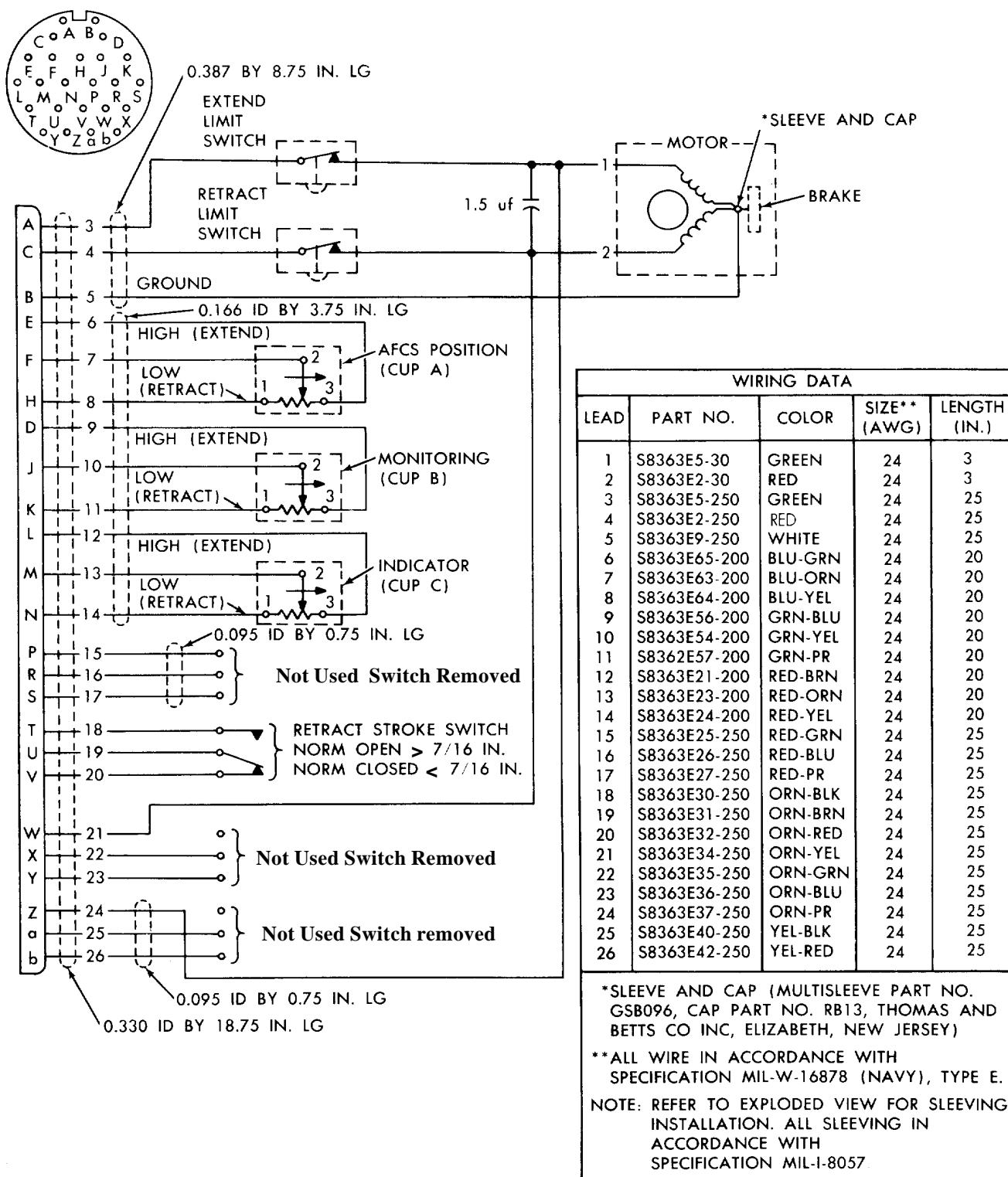
\*\*ALL WIRE IN ACCORDANCE WITH SPECIFICATION MIL-W-16878 (NAVY), TYPE E.

NOTE: REFER TO EXPLODED VIEW FOR SLEEVING INSTALLATION. ALL SLEEVING IN ACCORDANCE WITH SPECIFICATION MIL-I-8057

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Actuator 541928-1-1

Figure 4. Wiring Diagram (Sheet 1)



5CHA-59-3

Actuator 541928-2-1

Figure 4. Wiring Diagram (Sheet 2)

h. Replace defective actuator wiring in accordance with figure 4. Secure connections, using solder, Federal Specification **QQ-S-571, Composition Sn60W-RA-P2**, and install sleeving as shown in figure 4.

i. If pins (6, figure 2) require replacement, press old pins from end bell assembly (8) and press new pins into place.

j. If linings (7, 12) require replacement, remove old linings and clean cement residue, using methyl-ethyl-ketone, Federal Specification **TT-M-00261C**. Apply cement Stabond No. C 136, manufactured by American Latex Products Corp., Hawthorne, California, or equivalent (no military specification available), to mating surfaces of linings (7, 12), armature (13), and end bell assembly (8). Lightly clamp linings to mating parts and bake for 1 to 2 hours at approximately 135°C (275°F). Machine lining (7) so that distance from surface of lining to surface of end bell assembly which mates with stator assembly (20) is 0.564 to 0.569 inch. Machine lining (12) so that total length of lining and armature (12, and 13) is 0.365 to 0.370 inch.

## **WARNING**

Do not damage pins (6) when machining lining (7). Inside diameters of linings must be held concentric with bore of bearing insert in end bell assembly (8) and smaller hole in armature (13) within 0.010 inch total indicator reading. Cement must not be visible on sides of lining.

k. If braking surface of disk (11) is rough or scored, lap with abrasive paper, Federal Specification **P-P-00101, Grit No. 600**, moistened with dry-cleaning solvent, Federal Specification **P-D-680**, to restore finish of 20 microinches RMS, or better. Do not lap to the extent that anodic coating is removed.

l. If finish on outside surface of rotor assembly (19) and inside surface of stator assembly (20) is defective, smooth defective areas with abrasive paper, Federal Specification **P-P-00101, Grit No. 320**. Clean thoroughly and apply one spray coat of black enamel, Cati-Coat **No. F55BP7 and V66KP17** catalyst, manufactured by Sherwin-Williams Co., Cleveland, Ohio, or equivalent, and bake for 1/2 hour at approximately 135°C (275°F).

m. If finish on outside surface of motor is damaged, mask unpainted areas to protect from sanding residue and new paint. Refinish defective paint in accordance with step g; then, bake for approximately 24 hours at a temperature of 23.9° to 29.4°C (75° to 85°F).

n. Note the wear pattern in the floor of housing (85) due to the reciprocating motion of follow-up nut (77). If wear has caused grooves which, in any section of the housing floor, exceed .010 inch, repair the housing as indicated in figure 6.

## **15. LUBRICATION.**

16. Apply lubricate to the following components prior to reassembly:

a. Lightly coat bores in end bell assemblies (4, 8, figure 2) with **MIL-G-23827**, or equivalent.

b. Lubricate bearings (10, 15) with grease **ETR H**, manufactured by Shell Oil Co., Inc., New York, New York, or equivalent (no military specification available), prior to installation.

## **Note**

Each bearing requires 0.015 to 0.030 gram of grease.

c. Lubricate bearings (56, 70, figure 2-1) with grease, Specification **MIL-G-23827**, prior to installation. Bearing (56) requires 0.13 to 0.15 gram of grease and bearing (70) requires 0.010 to 0.025 grams of grease.

d. Lubricate all gears, jackscrew (83), torque bar (82), motor (69), and bearing bores in end cap (47) with grease, Specification **MIL-G-23827**.

e. Coat switch adjusting plates (25, 26, 45, 46) and fill cavities under plates with grease **MIL-G-23827** or equivalent.

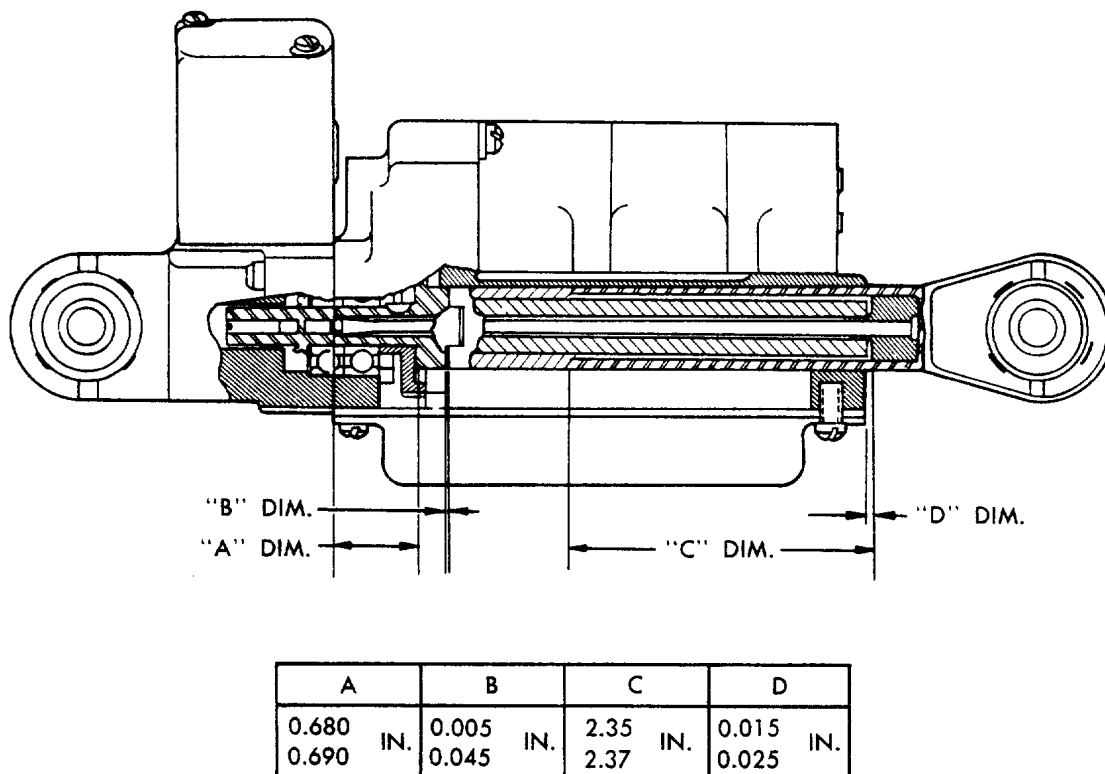
## **17. REASSEMBLY.**

18. Assemble motor (69, figure 1) in reverse sequence of index numbers assigned to figure 2, observe the following:

a. Install spring (18), washers (16, 17) and bearing (15) on shaft of rotary assembly (19) and install in end bell assembly (4). Lightly coat inside diameter of stator assembly (20) with a thin coat of grease, Specification **MIL-G-23827**, and install assembled parts in stator assembly.

b. Position spring (14), lining and armature (12 and 13), and disk (11) on shaft of rotor assembly (19). Press bearing (10) to shoulder of shaft.

c. Install approximately 0.010 inch thickness of washers (9), and install parts into end bell assembly (8), guiding notches of lining and armature assembly (12 and 13) onto pins (6) and wires of stator assembly (20) through hole in end bell assembly.



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Figure 5. Assembly Dimensions

d. Install screws (5) and tighten to between six and eight pound-inches torque.

e. Insert pins of 271206 Motor Brake Gap Adjuster through holes for screw (3) in end bell assembly (8). With pins just touching disk (11), set dial indicator of adjuster to zero. Apply pressure to disk and measure brake gap. If brake gap is not between 0.003 and 0.005 inch, add or remove washers (9) as required to establish proper brake gap.

f. After correct brake gap is established, separate parts enough to apply zinc-chromate primer, Specification **TT-P-1757**, to mating surfaces of stator assembly (20), end bell assemblies (4, 8), and screws (5). Re-assemble before primer dries.

g. Apply zinc - chromate primer, Specification **TT-P-1757**, to threads of screws (2, 3) and install before primer dries.

h. Test motor in accordance with paragraph 3-4 prior to completing actuator assembly.

i. Assemble actuator in reverse sequence of index numbers assigned to figure 2-1, in accordance with steps j through t.

j. Press pin (84) in housing (85) so that pin protrudes 0.050 to 0.060 inch above surface of housing.

### CAUTION

Verify that pin (81) is installed, even in the event no work was performed.

k. Insert connector (79) into housing (85). Insert torque bar (82) into connector with threaded end out. Thread power nut (80) into connector until ends are flush and slots aligned. Adjust power nut as required to obtain torque bar travel in connector within C dimension (figure 2-5). Insert tangs of follow-up nut (77, figure 2-1) in slots of power nut (80) to B dimension (figure 2-5). Thread jackscrew (83, figure 2-1) through follow-up nut and power nut and over torque bar (82). Using slot in end of torque bar, and a screwdriver, thread torque bar into jackscrew as far as it will go. Back off torque bar 1/2 to 3/4 turn until drilled holes in jackscrew and torque bar are aligned; then, install pin (81).

l. If jackscrew (83) is replaced, torque bar (82) must also be replaced. Follow installation procedures outlined in step k, except thread torque bar in jackscrew to obtain r dimension (figure 2-5). Locate A dimension (figure 2-5) and drill 0.0464 to 0.0469 inch diameter hole on centerline within 0.002 inch through jackscrew and torque bar: then install pin (81, figure 1). If torque bar only is replaced, drill 0.0464 to 0.0469 inch diameter hole through torque bar using existing hole in jackscrew as a pilot.

### **CAUTION**

Verify that nut (53) is torqued to 15 to 25 inch-pounds and pin (52) is installed, even in the event that no work was performed.

m. Install spur gear (75) and key (76) on jackscrew (83); then install bearing retainer (57) in housing (85) and bearing (56) on jackscrew. Install nut (53) and torque 15 to 25 pound-inches. If a new jackscrew is used, drill a 0.081- to 0.085-inch diameter hole through castellations of nut and jackscrew and install pin (52).

n. Temporarily assemble end cap (47) on housing (85). Measure gap between retainer (57) and end cap. Remove end cap and install washers (55) as required to obtain a gap of 0.001 to 0.003 inch.

o. Install assembled resistor (13), coupling (14), and gearshaft (15), making certain that gearshaft mates properly with jackscrew (83). Ensure resistor posts are oriented towards the motor as shown in figure 1. Ensure potentiometer cover (6) has tape, P/N **AN-5**, or equivalent, applied to inside side walls within 0.15 inch of top and bottom and resistor (13) is wrapped with tape, P/N **4529670544**, or equivalent.

p. Lubricate bearing bores in end cap (47) and motor (69) in accordance with paragraph 2-16 step d, and insert washers (71, 73) and bearings (70). Install gear assemblies (72, 74) and motor (69). Install end cap and washers (50) and screws (49). Torque screws to 40 to 60 inch-pounds to remove gap between retainer and end cap.

### **Note**

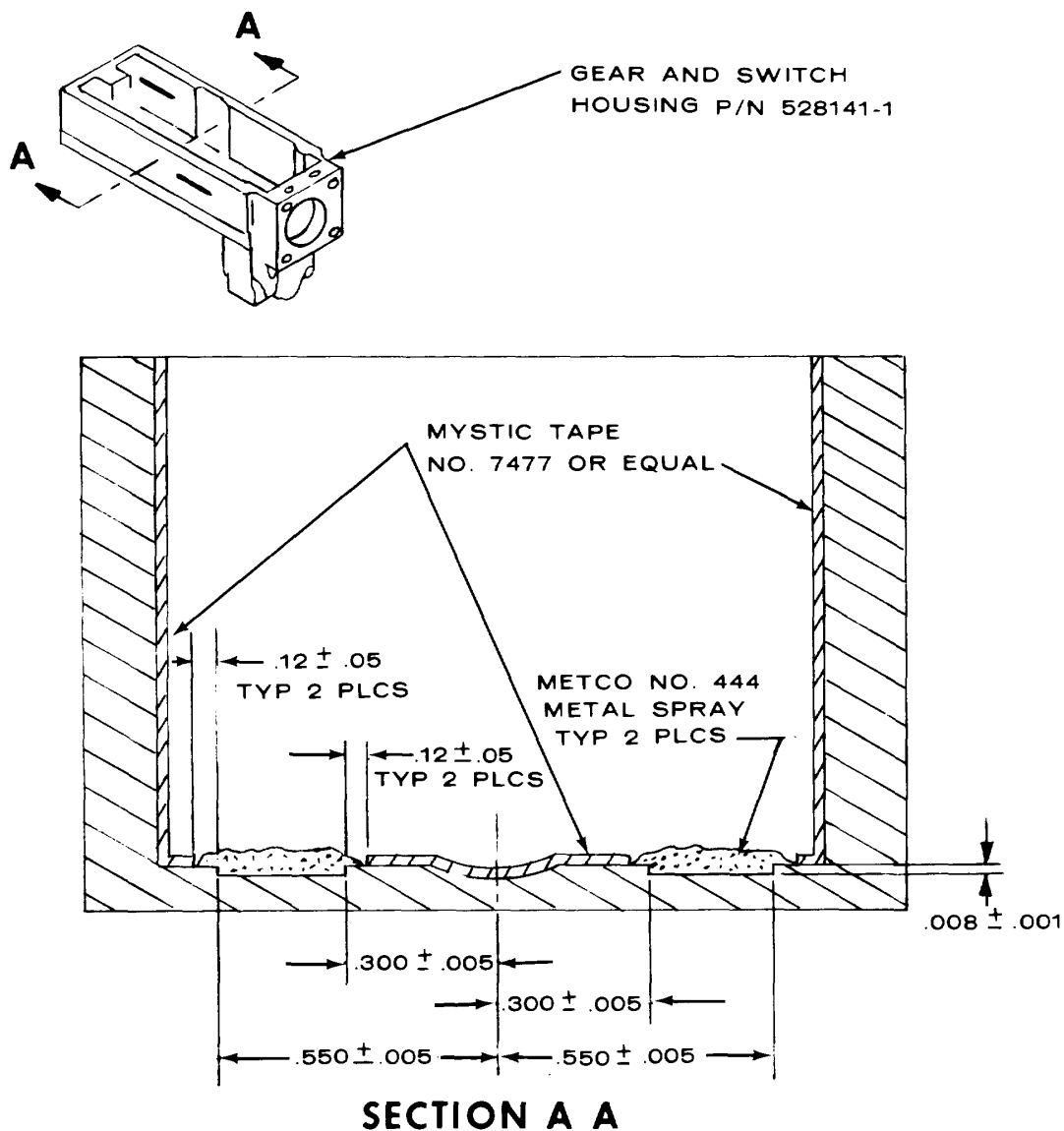
For the 541928-1-1 assembly, connecting wire leads to the switches associated with pins P, R, S, W, X, Y, Z, A, and B are optional. These switches are not used by the aircraft.

q. Install switches (28, 34) and connect electrical leads in accordance with wiring diagram, figure 2-4, using solder, Federal Specification **QQ-S-571**, Composition **Sn60-W-RA-P2**, in accordance with Specification **MIL-S-6872**. For 541928-2-1 assembly, bond spacer (31), bracket (40), and adapter (39) to each other and to housing (85). For 541928-1-1 assembly, bond spacer (31), bracket (40), and adapter (39) to housing (85) as required to prevent switch movement. Bond all parts using **STYCAST 2651 OR AMS 3692C** epoxy or an equivalent adhesive.

r. Lubricate switch adjusting plates (25, 26, 45, 46, figure 2-1) in accordance with paragraph 2-16, step e. prior to assembly.

s. Test actuator in accordance with Section III; then, coat edges of cover (22) with cement Specification **MMM-A-1617B**. Using same cement, seal around grommet (10) and leads entering motor (69) and housing (85).

t. Safety wire external screws, using wire, Military Standard **MS20995NC20-30 (ASG)**, in accordance with Military Standard **MS33540**.



1. Machine grooves (2) to dimensions shown.
2. Mask interior walls and floor areas as shown with Mystic Tape No. 7477 or equal.
3. Metal spray exposed floor areas using METCO 444 and Sealer No. 185.
4. Remove masking tape.
5. Machine sprayed areas flush with floor areas adjacent to center groove in housing floor.

Figure 6. Housing Repair

## TEST PROCEDURE

## ELECTROMECHANICAL LINEAR ACTUATOR

Part Numbers 541928-1-1 and 541928-2-1

This WP supersedes WP 003 00 dated 1 May 2007

## 1. GENERAL.

2. Conduct all tests at room temperature.
3. Test motor as a separate assembly, then test assembled actuator as specified.

## 4. MOTOR TEST PROCEDURE.

**WARNING**

Motor frame must be grounded during all tests.

**Note**

Test voltage is 115 volts AC, single phase, 400 Hz, unless otherwise specified.

a. Connect a 1.5-microfarad, 115-vac, nonpolarized capacitor between red and green electrical leads of motor. Connect white electrical leads together. (See Figure 1.) Use Electrical Power Test Set, Part No. 257916-1 or equivalent, to apply voltage and to monitor motor performance.

b. Apply 115 vac, 400 Hz, single phase, between red and white leads. Check that motor shaft rotates counterclockwise when viewed from shaft end of motor.

c. Repeat step b with voltage applied between green and white electrical leads; rotation must be clockwise.

d. Apply voltage between red and white electrical leads and check that minimum speed is 6800 rpm and maximum current is 0.9 ampere.

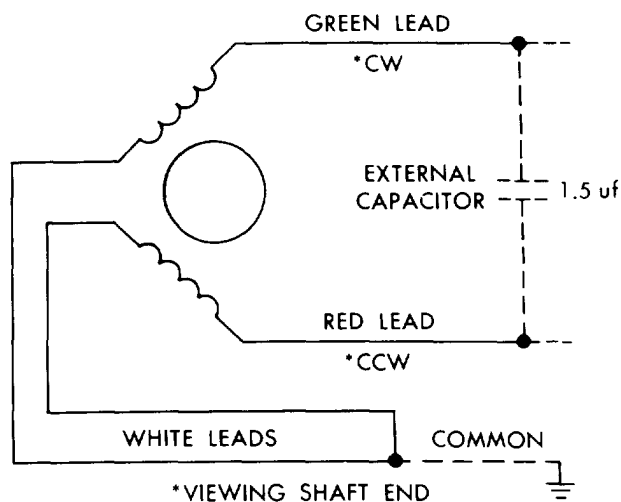
e. Repeat step d with rated voltage applied between green and white leads.

f. With no voltage applied, check breakout torque required to turn motor shaft; torque must be at least one ounce-inch. Gradually increase input voltage from zero to 85 vac; brake must release.

g. With motor operating at no-load speed, momentarily interrupt current; brake must engage and disengage.

h. Lock motor shaft and apply voltage between green and white leads; using 253724 Motor Test Dynamometer or equivalent, check that stalled motor torque is 5 ounce-inches minimum. Current must not exceed 1.1 ampere.

i. Repeat step h with voltage applied between red and white leads.



SCHA-59-5

Figure 1. Motor Wiring Diagram

**5. TROUBLESHOOTING.**

- a. Refer to Table 1 for motor troubleshooting,

**6. ACTUATOR TEST PROCEDURE.****CAUTION**

Verify that pin (81) is installed. Verify that nut (53) is torqued to 15 to 25 inchpounds. Verify that pin (52) is installed.

7. Test the actuator as follows:

**CAUTION**

Actuator end cap and end connector are permanently aligned. Do not attempt to turn connector to align for mounting or damage to anti-rotation device will result.

- a. Install actuator in Actuator Test Stand, Part No. NY-200, or equivalent, using suitable adapters.

**Note**

The internal anti-rotation device in the actuator permits rotation of the connector to  $\pm 8.0$  degrees. Axial rotation of the test stand connecting linkage must be restrained within  $\pm 1.0$  degrees to prevent loading of the antirotation device.

- b. Wire and code an electrical connector (67-06P18-24P, Amphenol -Borg Electronics Corp., Broadview, Illinois, or equivalent) in accordance with figure 2-4, and connect actuator to 257916-1 Electrical Power Test Set, or equivalent. Energizing of the individual terminals must result in operation as specified in Leading Particulars.

- c. Check axial rod end play, extend, retract, and stroke dimensions; refer to Leading Particulars. If extend dimension is too great, move extend limit switch toward the end cap. If extend dimension is too small, move extend limit switch toward end connector. If retract dimension is too great, move retract limit switch toward end cap. If retract dimension is too small, move retract limit switch toward end connector.

- d. With actuator fully retracted at  $8.059 \pm 0.005$  inches, check that the following conditions exist when specified connections are made:

Connect an ohmmeter across each of the following pairs of pins of actuator connector:

E-H - Ohmmeter reading 4500 to 5500 ohms  
 F-H - Ohmmeter reading less than 10 ohms  
 D-K - Ohmmeter reading 4500 to 5500 ohms  
 J-K - Ohmmeter reading less than 10 ohms  
 L-N - Ohmmeter reading 196.98 to 205.02 ohms  
 M-N - Ohmmeter reading 5.5 to 11.0 percent of actual value of L-N reading (10.8 to 22.6 ohms).

Connect a test lamp across each of the following pairs of pins of actuator connector:

T-U - Lamp out  
 U-V - Lamp on

- e. Check all pairs of pins (E-H, F-H, D-K, L-N, M-N) for resistance linearity as follows:

(1) Using analog multimeter (Simpson 260 or equivalent), extend actuator to full extend observing multimeter needle for any fluctuations in resistance. Resistance readings should be smooth (linear). Replace variable linear resistor (potentiometer) for any actuators showing fluctuations in resistance readings.

(2) Using analog multimeter (Simpson 260 or equivalent), retract actuator to full retract observing multimeter needle for any fluctuations in resistance. Resistance readings should be smooth (linear). Replace variable linear resistor (potentiometer) for any actuators showing fluctuations in resistance readings.

- f. Using digital multimeter, check all connector pins for shorts to case ground. Check wiring and replace variable linear resistor (potentiometer) for any actuators showing shorts.

- g. In the following steps h through m, conditions must be the same as given in step d, except as specified.

Table 1. Motor Troubleshooting		
Trouble	Probable Cause	Remedy
Motor does not operate; no current flows.	Power circuit defective.	Repair power circuit.
Motor does not operate under no-load conditions or operates at reduced speed with excessive current.	Test capacitor defective.	Replace capacitor.
	Leads improperly connected.	Connect leads properly.
	Excessive paint build-up between rotor assembly and stator assembly.	Remove excessive paint.
	Bearing defective.	Replace defective bearing.
	Brake sticking.	Check for defective disks or linings or incorrect brake gap; correct or replace defective parts.
Motor operates in one direction only.	Stator assembly defective.	Replace stator assembly.
Motor operates at less than specified speed and current is excessive.	Excessive paint build-up between rotor assembly and stator assembly.	Remove excessive paint.
	Bearing defective.	Replace defective bearing.
	Insert defective, end bell assembly.	Replace end bell assembly.
	Stator assembly windings shorted.	Replace stator assembly.
Stalled-motor current excessive.	Stator windings shorted.	Replace stator assembly.

h. With no load applied, energize unit through pin A of electrical connector. When extend stroke is 8.479  $\pm$ 0.005 inches, the following conditions should exist: (1) lamp between U-V must go out and lamp between T-U must go on within 0.0002 inches of actuator travel, maximum of each other and within the specified stroke and:

Voltage ratio across F-H must be 0.17 to 0.22;

(at 28VDC, 4.76 to 6.16 VDC)

Voltage ratio across J-K must be 0.17 to 0.22;

(at 28VDC, 4.76 to 6.16 VDC)

M-N ohmmeter reading must read 21.0 to 26.7 percent of L-N reading (41.4 to 54.7 ohms).

i. With no load applied, energize unit through pin A of electrical connector until extend length is 9.139  $\pm$ 0.005 inches and:

T - U - Lamp on

U - V - Lamp off

Voltage ratio across F-H must be 0.46 to 0.

51; (at 28VDC, 12.88 to 14.28 VDC)

Voltage ratio across J-K must be 0.46 to 0.

51; (at 28VDC, 12.88 to 14.28 VDC)

M-N ohmmeter reading must read 45.4 to 51.1 percent of L-N reading (89.4 to 104.8 ohms).

j. Energize unit through pin A of electrical connector and allow actuator to extend until it shuts off; full extend stroke must be 10.309  $\pm$ 0.005 inches and:

T - U - Lamp on

U - V - Lamp off

Voltage ratio across F-H must be 0.98 to 1.00; (at 28VDC, 27.44 to 28 VDC)

Voltage ratio across J-K must be 0.98 to 1.00; (at 28VDC, 27.44 to 28 VDC)

M-N ohmmeter reading must read 89.5 to 95.0 percent of L-N reading 176.3 to 194.8 ohms).

k. With conditions as specified in step d, except with actuator fully extended, energize unit through pin C of electrical connector. When retract stroke is 9.139 +0.005 -0.016 inches, the following must be met:

T - U - Lamp on

U - V - Lamp off

Voltage ratio across F-H must be 0.46 to 0.51;  
(at 28VDC, 12.88 to 14.28 VDC)

Voltage ratio across J-K must be 0.46 to 0.51;  
(at 28VDC, 12.88 to 14.28 VDC)

M-N ohmmeter reading must read 45.2 to 51.1 percent of L-N reading (89.0 to 104.8 ohms).

l. Energize unit through pin C of electrical connector until retract stroke is 8.479 +0.005 -0.016 inches. The following changes must exist, lamp T-U must go out and lamp U-V must go on within 0.008 inches of actuator travel, maximum of each other and within the specified stroke and;

Voltage ratio across F-H must be 0.17 to 0.22;  
(at 28VDC, 4.76 to 6.16 VDC)

Voltage ratio across J-K must be 0.17 to 0.22;  
(at 28VDC, 4.76 to 6.16 VDC)

M-N ohmmeter reading must read 21.5 to 26.7 percent of L-N reading (42.4 to 54.7 ohms).

m. Energize unit through pin C of electrical connector and let actuator run until it shuts off. Stroke must be 8.059 +0.005 inches and:

T-U - Lamp out

U-V - Lamp on

F-H - Ohmmeter reading less than 10 ohms;

J-K - Ohmmeter reading less than 10 ohms;

M-N - Ohmmeter reading 5.5 to 11.0 percent of actual value of L-N reading (10.8 to 22.6 ohms).

n. With a 350-pound tension or compression load applied, energize actuator; actuator must extend or retract fully within 23 to 35 seconds with a maximum current of 0.88 ampere.

o. Energize actuator with no load and allow to extend or retract at full speed. De-energize actuator; end connector must come to a stop within a linear distance of 0.0068 inch maximum.

p. With an 800-pound load applied to actuator and actuator at ambient temperature, energize unit through pin A or C and check end connector travel. Actuator must be capable of operating from dead stop at any position of jackscrew.

## 8. TROUBLESHOOTING.

a. Refer to Table 2 for actuator troubleshooting information.

**Table 2. Actuator Troubleshooting**

Trouble	Probable Cause	Remedy
Actuator fails to operate.	Power circuit defective.	Repair power circuit.
	Limit switches damaged.	Replace defective switches.
	Actuator jammed.	Disassemble and free; check and correct assembly tolerances.
	Motor defective.	Replace motor.
Actuator operates in one direction only.	Limit switch defective.	Replace defective switch.
	Motor defective.	Replace motor.
Actuator fails to shut off.	Limit switches incorrectly installed.	Correct switch installation.
	Limit switches damaged.	Replace defective switches.
Actuator does not extend or retract to required length.	Limit switch setting incorrect.	Reset switches.

**Table 2. Actuator Troubleshooting (Cont.)**

Trouble	Probable Cause	Remedy
Actuator exceeds maximum time for stroke with corresponding high amperage.	Jackscrew or drive nut assembly damaged.	Replace defective part.
	Gear train binding.	Disassemble and free gear train. Clean and lubricate gears.
	Bearings incorrectly shimmed.	Reshim bearings.
	Motor defective.	Replace motor.

