

400 Hz Connection  
Aircraft Electrical Maintenance Procedures

## RATIONALE

AIR4365 is being revised to reflect new diameters of receptacle pins in Figure 1, in accordance with reference MS90362. In addition, the word "pin" was replaced with "socket" in several places throughout the document for descriptive accuracy.

## 1. SCOPE

This SAE Aerospace Information Report (AIR) describes field-level procedures to determine if 400 Hz electrical connections for external power may have been subjected to excessive wear, which may result in inadequate disengagement forces.

## 2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 2.1 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, <http://assist.daps.dla.mil/quicksearch/>.

MS90362 (AN3114)	110 Volt, AC, Aircraft Receptacle
MS90328 (AN3430)	Cable Assembly, External Electric Power, Aircraft, 115/200 Volts, 400 Hz
MIL-C-7974	Cable Assemblies and Attachable Plugs, External Electrical Power, Aircraft

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### 3. PROBLEM

The aircraft receptacle is configured to MS90362 (AN3114). The plug end of the cable from the 400 Hz external source is configured to MS90328 (AN3430). With today's widespread use of external 400 Hz systems, plug and receptacle wear has increased, resulting in problems with the electrical connection.

One or more worn or loose contacts in the connector can cause high contact resistance which results in a hot plug, in some cases a fire, or loss of a phase, or loss of control voltage (E & F) which causes the aircraft to reject the external 400 Hz power.

The plug presents the bigger problem because the combined grip of the sockets must be sufficient to prevent the plug from coming loose from the aircraft receptacle. This grip must be sufficient to support the weight of the plug and about 10 ft (3.05 m) of cable. In the case of wide body aircraft, the receptacle on board the aircraft should have the pin diameters checked.

Military Standard MIL-C-7974 specifies 80 lb (356 N)  $\pm$  20 lb (89 N) insertion force and maximum 100 lb (445 N) extraction force. In an effort to establish procedures for checking the plug and receptacle, several methods have been tried. Tests conducted by various manufacturers and airlines on plugs in service show mixed results. If you adopt the 60 lb (267 N) to 100 lb (445 N) insertion and extraction forces, it is reasonable to assume that 15 lb (67 N) to 25 lb (111 N) on each socket would indicate a good contact. Experience shows that 4 sockets x 25 lb (111 N) results in a total force required of over 100 lb (445 N). This total force has not been fully investigated but could be as high as 150 lb (667 N) due to misalignment. Some tests have shown four sockets that measured low individually but show high collective readings because of misaligned contacts.

### 4. RECOMMENDATION

While the aforementioned results may not show a reliable test method, the following procedures are recommended to increase plug and receptacle life and safety:

#### 4.1 Receptacle

The individual pin diameters and alignment shall be checked on a schedule basis. Pin diameters should be as shown in Figure 1 using the tools shown in Figure 2.

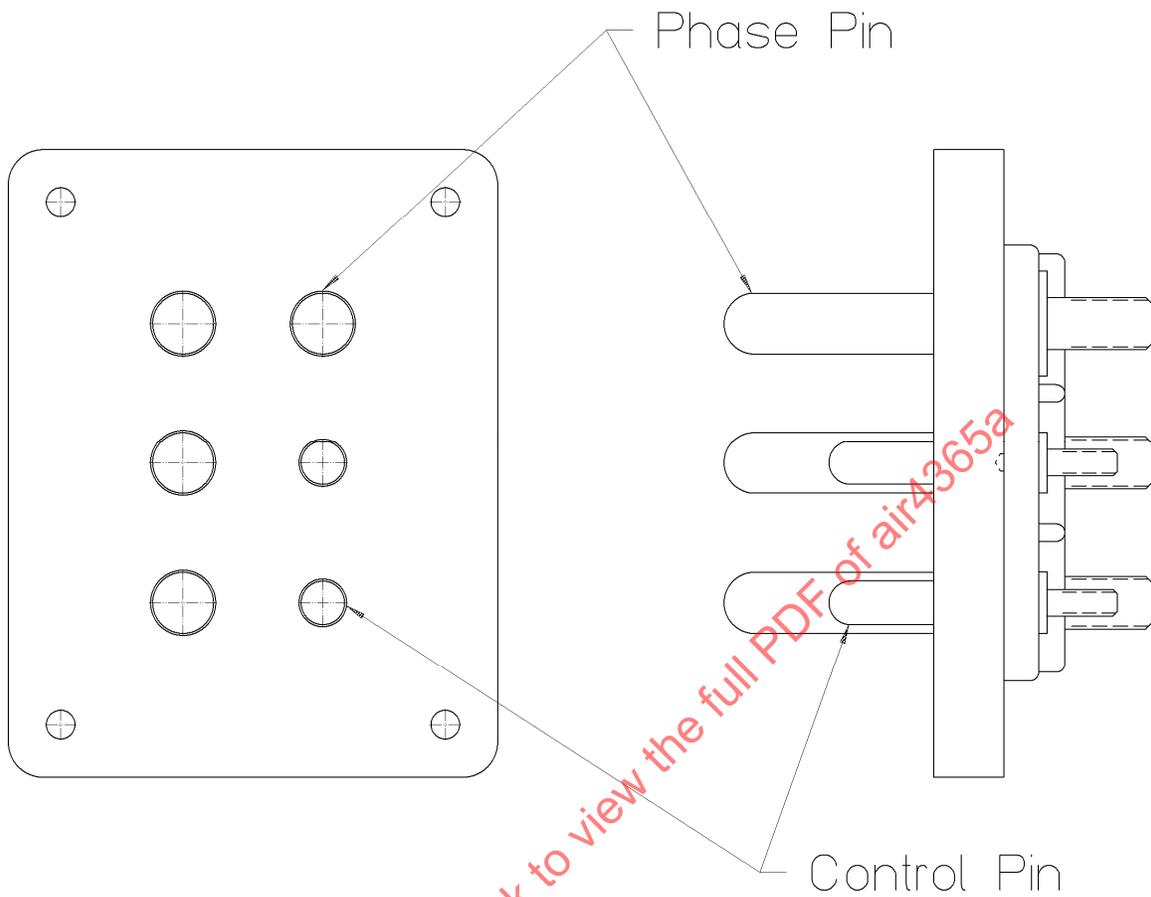
#### 4.2 Plug

Since testing the total insertion and extraction forces would probably require two people or a special fixture because of the force involved (100 lb (445 N)), we recommend that a tool for checking individual sockets and pins be used as shown in Figure 2. The forces and procedures are as shown in Figure 2.

#### 4.3 Summary

These recommended checks should reduce the incidence of failure in these two components. In addition, the following recommendations for proper maintenance and handling will extend plug life.

- Keep the sockets clean using a 45 caliber nylon bore cleaning brush for power contacts and a 32 caliber brush for control contacts
- When disengaging the plug, pull smoothly with a gentle rocking motion
- Grasp only the plug body when removing the plug
- Make every attempt to not let the plug contact the ramp surface



The receptacle face and pins should be cleaned before checking

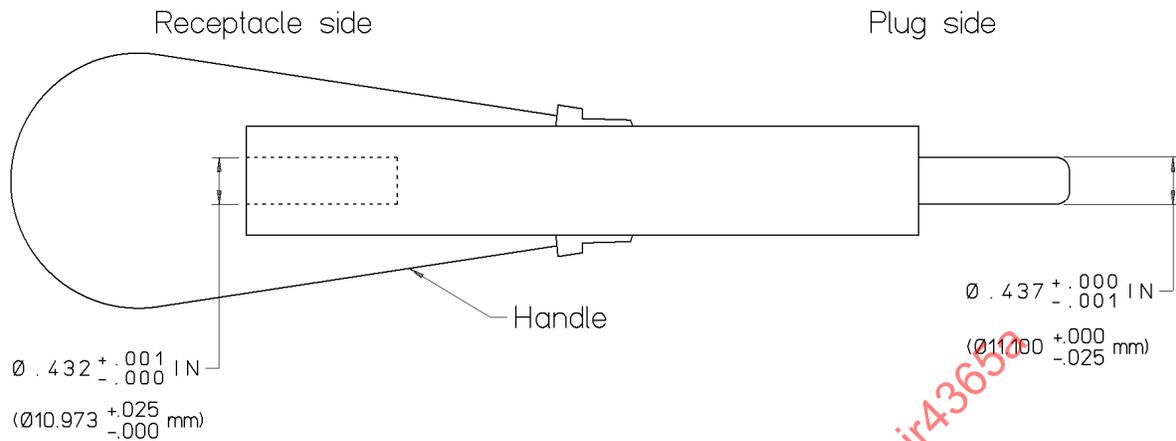
Inspection Frequency: As routinely scheduled

	New Diameter	Minimum Diameter*
Phase Pin	0.436 in (11.07 mm)	0.432 in (10.97 mm)
Control Pin	0.311 in ( 7.90 mm)	0.307 in ( 7.80 mm)

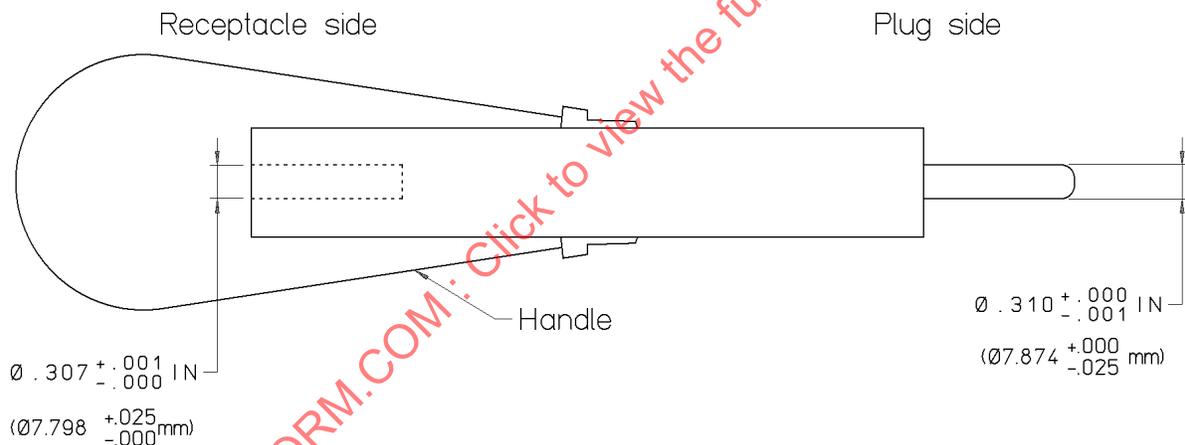
\*Note: When the pins are worn to the minimum diameter (loose) or the pins are bent the receptacle should be replaced.

FIGURE 1 - AIRCRAFT RECEPTACLE

## Phase Contact Gauge



## Control Contact Gauge



## Notes:

1. Tools for performing this function are available from commercial sources.
2. The plug contacts should be cleaned per figure 3 before testing.
3. Recommended frequency maximum 4000 insertions.
4. Extraction force to be minimum 15 lb (66.7 N) per phase socket.
5. Extraction force to be minimum 3 lb (13.3 N) per control socket

FIGURE 2 - WEAR GAUGE FOR PLUG AND RECEPTACLE