

**WSSS AD 2.9 SURFACE MOVEMENT GUIDANCE AND CONTROL SYSTEM AND MARKINGS**

**SAFEGATE AIRCRAFT DOCKING GUIDANCE SYSTEM - SAFEDOCK**

**1. INTRODUCTION**

1.1 The Safegate Aircraft Docking Guidance System - SAFEDOCK is a fully automatic aircraft docking guidance system installed at the fixed gates in Terminals 1, 2 and 3 of Singapore Changi Airport. ←

**2. DESCRIPTION OF SYSTEM**

2.1 The system is based on a laser scanning technique and it tracks both the lateral and longitudinal position of the aircraft. This 3D technique allows the system to recognise the incoming aircraft and check it against the one selected by the operator to ensure that the pilot is provided with the correct stop indication for the aircraft.

2.2 The system is operated only in the Automatic Mode. When the system fails, the aircraft is to be marshalled into the stand manually.

2.3 Azimuth guidance, continuous closing rate information, aircraft type, etc., are shown to the pilot on a single display clearly visible for both pilot and co-pilots. Figure A shows the Display and Laser Scanning Unit mounted on the terminal in front of the aircraft stand.

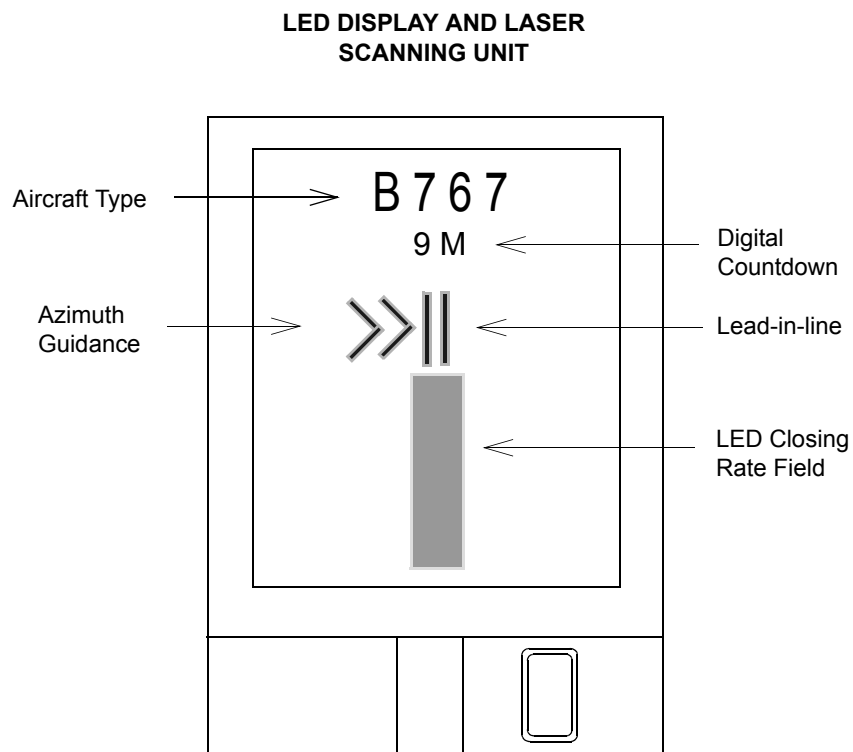


Figure A

### 3. DOCKING PROCEDURES

3.1 Check that the correct aircraft type is displayed. The scrolling arrows indicate that the system is activated.

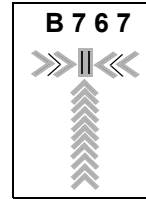


Figure 1  
System tracking  
for aircraft.

3.2 Follow the lead-in line

3.3 When the solid yellow closing rate field appears, the aircraft has been caught by the scanning unit. The scanning unit now checks that the aircraft is the correct type and the display provides azimuth guidance information (see figure 1).

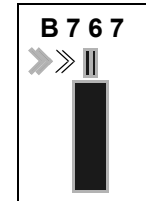


Figure 2  
Aircraft tracked  
and identified  
correct.

3.4 Look for the flashing red arrow and solid yellow arrow which provide azimuth guidance information. The flashing red arrow shows which direction to steer, while the solid yellow arrow gives an indication of how far the aircraft is off the centreline (see figure 2)

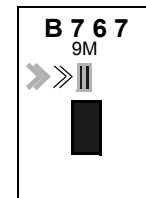


Figure 3  
Docking of  
aircraft  
commences.

3.5 When the aircraft is 15m from the stop position, closing rate information is given. "Distance to go" is indicated by turning off one row of LEDs (Laser Electronic Displays) for every half metre that the aircraft advances towards the stop position. From 15m to the stop position, a digital display will indicate the distance from the stop position for every 1m. At 3m from the stop position, the display will indicate the distance from the stop position for every 0.2m (see figures 3, 4 and 5).

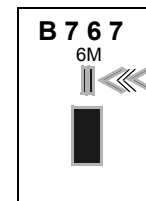


Figure 4  
LED closing rate  
field starts dimin-  
ishing when the  
acft is 15m fm  
stopbar at one  
row for every  
0.5m that the acft  
moves forward.

3.6 When the correct stop position is reached, all of the LEDs for the closing rate field will be off, the word "STOP" in yellow will appear in the display and two red, rectangular fields will light in the azimuth guidance area of the display (see figure 6).

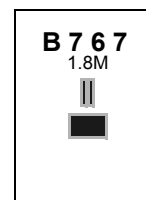


Figure 5  
LED closing rate  
field getting  
shorter as acft  
moves nearer to  
stopbar.

3.7 If the aircraft stops in the correct position, "OK" will be displayed after a few seconds (see figure 7).

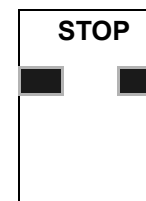


Figure 6  
Pilot to stop acft  
when 'STOP' is  
displayed.

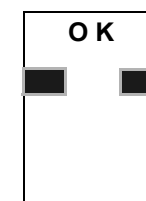
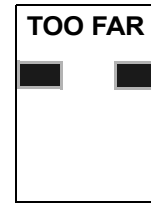


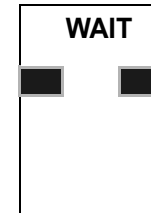
Figure 7  
Informs the pilot  
that everything is  
in order and he  
can shutdown  
engine.

3.8 If the aircraft has gone past the correct stop position, the display will show "TOO FAR." (see figure 8).



**Figure 8**  
Indicates that the acft has gone beyond the stopbar. Pilot to check with ground engineer on the next move.

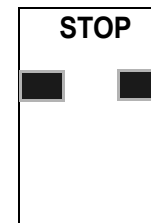
3.9 The aircraft must be identified at least 12m before the correct stop position. If this does not occur, the system displays "STOP" and then "WAIT" with two red, rectangular fields being lit in the azimuth guidance area of the display. The system will then attempt to identify the aircraft. If successful, the docking procedure will continue. If not, "WAIT" will be replaced with "STOP." (see figures 9 and 10).



**Figure 9**  
Pilot to hold acft and wait for other instructions from the display.

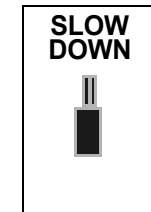
**4. SAFETY MEASURES**

4.1 Pilot should not turn an aircraft into the parking stand if the docking system is not activated or on seeing a wrong aircraft type displayed on the system.



**Figure 10**  
"STOP" may appear suddenly in the process of docking. Pilot to stop immediately and wait for further instructions.

4.2 When using the docking system, pilots are to taxi into the aircraft stand at minimum speed. The system will display "SLOW DOWN" to inform the pilot if the aircraft's taxiing speed is too fast (see figure 11).



**Figure 11**  
Informs the pilot that the acft travelling speed is too fast. Pilot to slow down the speed.

4.3 To avoid overshooting, pilots are advised to approach the stop position slowly and observe the closing rate information displayed. Pilots should stop the aircraft immediately when seeing the 'STOP' display or when given the stop sign by the aircraft marshaller.