Australian Government
National Measurement Institute
Bradfield Road, West Lindfield NSW 2070

Supplementary Certificate of Approval

NMI S538

Issued by the Chief Metrologist under Regulation 60
of the
National Measurement Regulations 1999

This is to certify that an approval for use for trade has been granted in respect of the instruments herein described.

ICM Model ABD Self 'Bag-drop' Control System for Airline Baggage Weighing

submitted by ICM Airport Technics Australia Pty Ltd
4A / 42 Church Avenue
Mascot NSW 2020

NOTE: This Certificate relates to the suitability of the pattern of the instrument for use for trade only in respect of its metrological characteristics. This Certificate does not constitute or imply any guarantee of compliance by the manufacturer or any other person with any requirements regarding safety.

This approval becomes subject to review on **1/12/21**, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern – provisionally approved – interim certificate issued	3/11/10
1	Variant 1 – provisionally approved – interim certificate issued	29/11/10
2	Variant 2 – provisionally approved – interim certificate issued	14/02/11
3	Pattern – approved – certificate issued	18/04/11
4	Pattern amended – notification of change issued	8/06/11
5	Variant 1 approved – certificate updated & issued	26/08/11
6	Certificate reviewed, pattern amended (brand, submittor& clause 1.2) -Variants 2 to 5 approved - certificate issued	11/04/16

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with approval number ‘NMI S538’ and only by persons authorised by the submittor.

Note: The approved weighing instrument to which this system is attached shall also carry its own markings and approval number.

It is the submittor’s responsibility to ensure that all instruments marked with this approval number are constructed as described in the documentation lodged with the National Measurement Institute (NMI) and with the relevant Certificate of Approval and Technical Schedule. Failure to comply with this Condition may attract penalties under Section 19B of the National Measurement Act and may result in cancellation or withdrawal of the approval, in accordance with document NMI P 106.

Signed by a person authorised by the Chief Metrologist to exercise their powers under Regulation 60 of the *National Measurement Regulations 1999*.

Dr Amanda Rawlinson

TECHNICAL SCHEDULE No S538

1. Description of Pattern approved on 3/11/10

A ICM model ABD control system (Figures 1 and 2) which provides for the weighing of baggage as part of an airline self 'bag-drop' system – the 'bag-drop' functionality may be part of a more extensive airline check-in system, and may include functionality additional to just the weighing operations.

The system is connected to an Atrax C24B weighing instrument as described in approval NMI 6/9C/244B which provides the weight information.

Note : References to 'airline' may also be taken to refer to 'airport' as appropriate depending on the operator of the system.

Note : This instrument was formerly known as a QANTAS Model ABD, and was submitted by Qantas Airways Ltd. The instrument may carry the earlier branding.

1.1 Field of Operation

(a) The system allows a pre-set tare value, associated with use of a baggage tray (tub) the presence of which is indicated by a radio frequency identification (RFID) tag, to be subtracted from the gross weighed value. Only baggage trays with the particular RFID identification associated with the pre-set tare may be used with the system.

Note: The baggage trays used are nominally the same, and the system uses the same pre-set tare value for all trays. The system operator is responsible for ensuring that the pre-set tare value used is suitable to ensure correct weighing.

(b) The system provides a sequence of operations intended to ensure correct measurement, including arrangements for checking of the zero condition of the weighing instrument, and re-zeroing or requesting manual intervention of a supervisor/attendant as appropriate.

(c) The system provides various sensors to aid proper operation and for security and related purposes. Of particular relevance to the weighing operation are sensors (laser scanners and/or 'light curtains') to detect intrusion into the weighing area.

(d) The system includes arrangements for indicating oversize baggage. This approval does NOT approve any aspect of the determination of baggage size.

(e) Weight data from the ABD system is transferred to the airline computer system which determines whether applicable baggage weight limits have been exceeded, and if appropriate any additional fees to be charged for carriage. The applicable baggage weight limits and rates for carriage are the subject of particular airline policies and are NOT covered by this approval.

(f) Additional functions not related to the weighing function may be provided (e.g. related to client identification, check-in, seat allocation, safety and security and payment). Such functions may be provided directly by the airline baggage weighing control system console, or by other equipment interfaced to it.

(g) The nominal supply voltage is 240 V AC.

1.2 System Description

The weight information is provided by an Atrax model C24B non-automatic weighing instrument having a model OP-960 or model OP-960+ indicator (as described in approval NMI 6/9C/244B). The Atrax model C24B instrument is a Class  weighing instrument with a maximum capacity of 100 kg, and a verification scale interval of 0.1 kg.

Note 1: Variants of the Atrax model C24B described in NMI 6/9C/244B may also be used, provided they have a verification scale interval of 0.1 kg and a model OP-960 or OP-960+ indicator (e.g. instruments may be of Class 3 or 4, and may have a maximum capacity of up to 150 kg).

Note 2: The ABD system will not necessarily process items up to the maximum capacity of the Atrax model C24B instrument, nor down to its minimum capacity.

The Atrax model C24B instrument is interfaced to, and provides the weight information for, the model ABD control system, which comprises the following items:

Note: For items below marked (*), 'Compatible and Equivalent' equipment may be used. 'Compatible and Equivalent' refers to equipment of the same or better specifications, requiring no changes to software for satisfactory operation of the complete system including all checking facilities.

(i) Customer interface screen

An ELO model 1537L touch-sensitive liquid crystal display (*) which provides the interface to the system.

This screen also provides the interface ('override' screens) for the supervisor/ attendant when appropriate (access to supervisor/attendant mode is restricted by use of airline employee tags).

(ii) ABD system computer

A Dell model USFF computer (*) using Microsoft Windows XP operating system running ABD software controls the ABD system and is connected to the indicator of the weighing instrument (via a MOXA NPort 5410 serial device server (*)), the customer interface screen, and also the PLC.

(iii) Programmable logic controller (PLC)

An Omron programmable logic controller (PLC) interfaces additional sensors of the ABD system to the ABD system computer, and provides signals to equipment such as the conveyor drives (both of the weighing conveyor and output conveyor) from the system.

The PLC is also connected to the indicator of the weighing instrument and provides signals to zero the instrument when appropriate.

(iv) Printers

Two Fujitsu Frontech model F9860 (*) printers are provided.

One printer is used to print;

(a) a customer baggage receipt (e.g. to be used for baggage reclaim) (see Figure 3b). This receipt is not for trade use; and

(b) an excess baggage payment advice ticket (see Figure 3c).

Another printer prints a label to be attached to the baggage in the situation of overweight baggage (see Figure 3a for an example). This label contains weight information but is not for trade use (it is for safety-related purposes).

The system prevents operation in case of printer errors such as out of paper conditions, and provides warning indications prior to this.

(v) Baggage tray (tub)

The system uses baggage trays, all nominally of similar weight and fitted with RFID tags. See note under item (a) of clause **1.1 Field of Operation** above.

(vi) RFID tag reader

The system utilises a Sick model RFI641 (*) RFID tag reader to determine the presence of a baggage tray (tub) on the weighing system.

Additional RFID tag readers may be used for other purposes (e.g. similar to item (vii) below).

(vii) Bar code scanning, RFID card reading

The system includes a number of bar code scanning devices (similar devices such as RFID card reading devices may also be used) for purposes such as reading boarding passes, baggage tags, etc.

These devices may also provide access to the supervisor/attendant mode of the system.

(viii) Light curtain, laser scanning, optical sensors

The system utilises 'light curtain' devices and similar laser or optical sensors to detect intrusions into the weighing area (to aid the weighing process and for security/safety reasons).

These devices may also provide facilities such as the detection of oversize baggage (see item (d) of clause **1.1 Field of Operation** above).

(ix) Interface to airline computer system

The system interfaces (via a 'Bag Drop Server') to the airline's computer system and its databases to access passenger and flight details, store baggage information, determine appropriate baggage limits, and to determine the rate and amount of charges for excess baggage (if appropriate).

1.3 Software

The measurement related aspects of the system operation are provided in a software module which has its own version number (i.e. 'NMI Module v1.0a'); this version number is displayed at the bottom right of the 'override' screens (which are provided for use of supervisors/attendants).

Other aspects of the instrument operation (e.g. related to airline business processes, and determination of baggage limits) are provided by other software modules. A version number for this latter software is also provided at the bottom right of the 'override' screens (e.g. 'ABD v3.0a'). Version numbers ABD v3.0a or later are acceptable.

1.4 Operation and Checking Facilities

At the appropriate time in the customer 'bag-drop' procedure, the ABD system requests the customer to place their baggage on the weighing platform. The baggage may either be placed directly on the weighing platform (direct bag weighing) or may be placed in a baggage tray (tub) for weighing (e.g. for items which may be problematic in the baggage transfer system).

The system is also designed to correctly handle situations in which the customer places baggage on the weighing system prior to being requested in the 'bag-drop' procedure.

Note: It is assumed that prior to the weighing procedure, the baggage will have been tagged for identification purposes, either by use of bar coded tags provided at the time of check-in (obtaining boarding pass), or by use of an RFID bag tag (provided by the airline). If the baggage has not been tagged for identification purposes, the system will detect this and request tagging accordingly.

The typical weighing ('bag drop') procedure is as follows:

- passenger scans boarding pass.
- system requests baggage to be placed on weighing conveyor either directly, or in a baggage tray (tub), dependent on the nature of the baggage.

a) Direct Bag Weighing

- passenger places baggage directly on the conveyor of the weighing instrument; and
- baggage weight is determined from the weighing instrument and displayed on the customer interface screen (similar to Figure 4, but without the information at lower right of the screen).

b) Using Baggage Tray

Where the ABD system RFID tag reader detects that a baggage tray is being used, the weighing process is as follows:

- recalls the pre-set tare value of the baggage tray from the 'ADB NMI' software module referred to in clause **1.3 Software** above;
- reads the (gross) weight value from the approved weighing instrument;
- subtracts the tare value from the weight value provided from the approved weighing instrument; and
- provides a net weight value for the baggage, with suitable indication (see Figure 4).

Dependent on the situation the system may print baggage label(s), in which case the customer is requested to attach these to the baggage – this may include an overweight warning label for safety purposes (Figure 3a); this is not for trade use. In some situations, e.g. if the baggage is provided with an RFID baggage tag, data such as flight details may be written to this RFID tag.

The baggage data, including baggage weight is provided to the airline's computer system, which determines the appropriate baggage allowance for the passenger, or group of passengers (e.g. according to ticket class, frequent flyer status, etc).

Note: The existing practice in the airline industry is that baggage limits are determined using values in whole kilograms only. Consequently the value determined by the weighing instrument is truncated (rounded down to a whole kilogram value). This rounded value is used by the airline's computer system for determination of baggage limits and excess baggage charges. Where a total of several baggage weights is provided (e.g. on the Excess Baggage Advice shown in Figure 3c), this is based on a summation of these truncated weight values.

According to this determination, the customer may be offered an opportunity to re-pack baggage prior to proceeding and the airline's computer system may determine and initiate actions such as the following (and in some cases a combination of these):

- the baggage is within appropriate allowance and no further charges apply
- the baggage is too heavy to be allowed (or is required to be checked in using a manual system)
- additional charges apply to allow carriage of the baggage.

In the latter case the system provides an estimate of excess baggage charges on an Excess Baggage Advice printout (example shown in Figure 3c).

The appropriate baggage allowance and charge is determined according to the airline's policies (typically available to the customer at the time of booking, e.g. through the airline's website). Actual charges may depend on factors not evident within the ABD system, and therefore the excess amounts and charges shown on the Excess Baggage Advice are considered estimates only. Payment of excess baggage charges is made using other airline systems.

The determination of the appropriate baggage allowance and charge is considered to be outside the scope of this certificate.

Hence only the weight value shown in the place of YYY (see below) on the Excess Baggage Advice is considered to be approved for trade use.

Checked Baggage:
XX pieces: total YYY kg

A baggage receipt may also be produced – this is for baggage reclaim purposes and is not for trade use (see Figure 3b for an example).

Airline employees may be able to access special modes of the instrument with additional functions (including a 'Zero Scale' button). An example is shown in Figure 5.

1.5 Zero

The automatic zero tracking facility of the Atrax weighing instrument shall be enabled.

In addition, the ICM ABD system has provision to initiate zeroing of the Atrax instrument as part of its sequence of operation, and periodically, when the platform is known to be empty.

1.6 Pre-set Tare

The pre-set tare value (subtracted from the gross weight in the case of use of a baggage tray) shall have the same scale interval as the weighing instrument.

1.7 Verification Provision

The ICM ABD system has provision for the application of a verification mark.

1.8 Descriptive Markings

The ICM ABD system is marked with the following data (shown below at right):

Manufacturer's name or mark	ICM (#)
Model number	ABD
Serial number	……..
Maximum capacity	*Max* = …….. kg (*)
Minimum capacity	*Min* = …… kg (*)
Verification scale interval	*e* = …….. kg (*)
Pattern approval mark	NMI S538

(*) These markings shall be the same as those of the weighing instrument to which the ABD system is connected.

(#) May also be known as a QANTAS instrument.

These markings are in addition to markings required in the approval of the weighing instrument to which the ABD system is connected.

2. Description of Variant 1 approved on 26/08/11

The ICM model ABD control system with a modified software module containing measurement related aspects, i.e. the NMI Module software described in clause **1.3 Software** is now version 'NMI Module v1.0b'.

The system operation is as described for the pattern, except that the pre-set tare value of the baggage tray is stored in a configuration file rather than within the NMI Module. Hence in the description of a typical weighing ('bag drop') procedure using a baggage tray (as described in clause **1.4 Operation and Checking Facilities** subclause (b)), the first dot point is replaced by the following for this variant. (The remaining three dot points remain unchanged.)

"• obtains the pre-set tare value of the baggage tray from a configuration file (external to the NMI Module described in clause **1.3 Software**);"

3. Description of Variant 2 approved on 11/04/16

The 'ICM Series 1 ABD' control system (Figure 6), intended for weighing carried out, by airline staff, or in a self-service arrangement (but with supervision of airline staff). The system may also be configured in an arrangement for the weighing of oversize baggage.

The system is similar to the pattern, with the following significant differences.

- uses a hand held barcode and/or RFID tag scanning device (as an alternative to, or additional to, any such devices incorporated within the equipment).
- The software module containing measurement related aspects as described in variant 1 (i.e. the NMI Module described in clause 1.3 Software) is now version 'NMI Module v1.0b3'.
- The software related to other aspects of the system operation is now version 6.x or later.
- Modified display screens (see Figure 6), including an increased size of weight display and provision of a zero indicator (i.e. →0←).
- This system does not incorporate arrangements for detection of a baggage tray and subtraction of the corresponding pre-set tare value (if necessary, a baggage tray would need to be added by the airline staff after weighing had been carried out).

The typical weighing ('bag drop') procedure is as follows:

- boarding pass is scanned (using hand held scanner if necessary).
- system requests baggage to be placed on weighing conveyor.
- passenger places baggage on the conveyor of the weighing instrument, scans the bag tag (using hand held scanner if necessary); and
- baggage weight is determined from the weighing instrument and displayed on the customer interface screen (similar to Figure 4, but without the information at lower right of the screen).

4. Description of Variant 3 approved on 11/04/16

The ICM ABD control system with later software versions.

The software module containing measurement related aspects as described in variant 1 (i.e. the NMI Module described in clause 1.3 Software) is now version 'NMI Module v1.xxx'.

The software related to other aspects of the system operation is now version 6.x or later.

Operation is as described for the pattern with the exception of modified display screens, including increased size of weight display and provision of a zero indicator (i.e. →0←).

5. Description of Variant 4 approved on 11/04/16

The 'ICM Series 7 ABD' control system, which uses ABD version 8.x software (8.4 or subsequent), and NMI Module version 7.xxx).

This system is similar to the pattern, but introduces a software arrangement in which the system has a capability to utilise alternative software modules tailored to suit different airlines (on the one ICM ABD system).

Note: Although customer interface screens, operation screens and baggage receipts may vary between airline software modules, it is the responsibility

of ICM Airport Technics Australia Pty Ltd to ensure that the clarity and size of information (particularly weight values), correspondence between the displayed weight value and that of the weighing instrument, and operation sequence does not differ substantially from that described or shown in this certificate.

6. Description of Variant 5 approved on 11/04/16

The pattern or variants utilising 3D image recognition software and associated hardware, to detect presence of a baggage tray (tub), rather than using the RFID equipment described for the pattern. The image recognition may also be used for other purposes.

Baggage trays (tubs) used in this situation are not necessarily fitted with RFID tags.

Note: The baggage trays used are nominally the same, and the system uses the same pre-set tare value for all trays. The system operator is responsible for ensuring that the pre-set tare value used is suitable to ensure correct weighing.

TEST PROCEDURE No S538

The maximum permissible errors applicable are those applicable to the weighing instrument to which the ABD system is connected (or in Schedule 1 of the *National Trade Measurement Regulations 2009*). The weighing instrument to which the ABD system is connected shall be verified in accordance with any tests specified in the approval documentation for the weighing instrument, and in accordance with any relevant tests specified in the national instrument test procedures. The following are additional tests to be carried out for verification of the ABD system.

The use of a supervisor/attendant tag to access an override screen and keys to access the indicator of the weighing instrument will be required.

1. Check the version number of the measurement related system software, as described in clause **1.3 Software**.

2. Check, for baggage items without use of a baggage tray (tub);

   - at or close to (but above) the minimum capacity (*Min*) of the weighing instrument
   - close to (but above) the ‘underweight’ limit set by the airline for carriage of baggage (2 kg)
   - close to (but below) the ‘overweight’ limit set by the airline for carriage of baggage (32 kg), and
   - at or close to the maximum capacity (*Max*) of the weighing instrument, that

   the indication of luggage weight on the Customer Interface Screen is identical to that on the indicator of the approved weighing instrument.

3. Check, for baggage items using a baggage tray (tub);

- close to (but above) the ‘underweight’ limit set by the airline for carriage of baggage (2 kg), and
- close to (but below) the ‘overweight’ limit set by the airline for carriage of baggage (32 kg), that

(i) the indication of gross weight is identical to that on the indicator of the approved weighing instrument

(ii) the calculation of net weight is arithmetically correct, i.e. gross weight – baggage tray (tub) value as displayed on the instrument = net weight, and

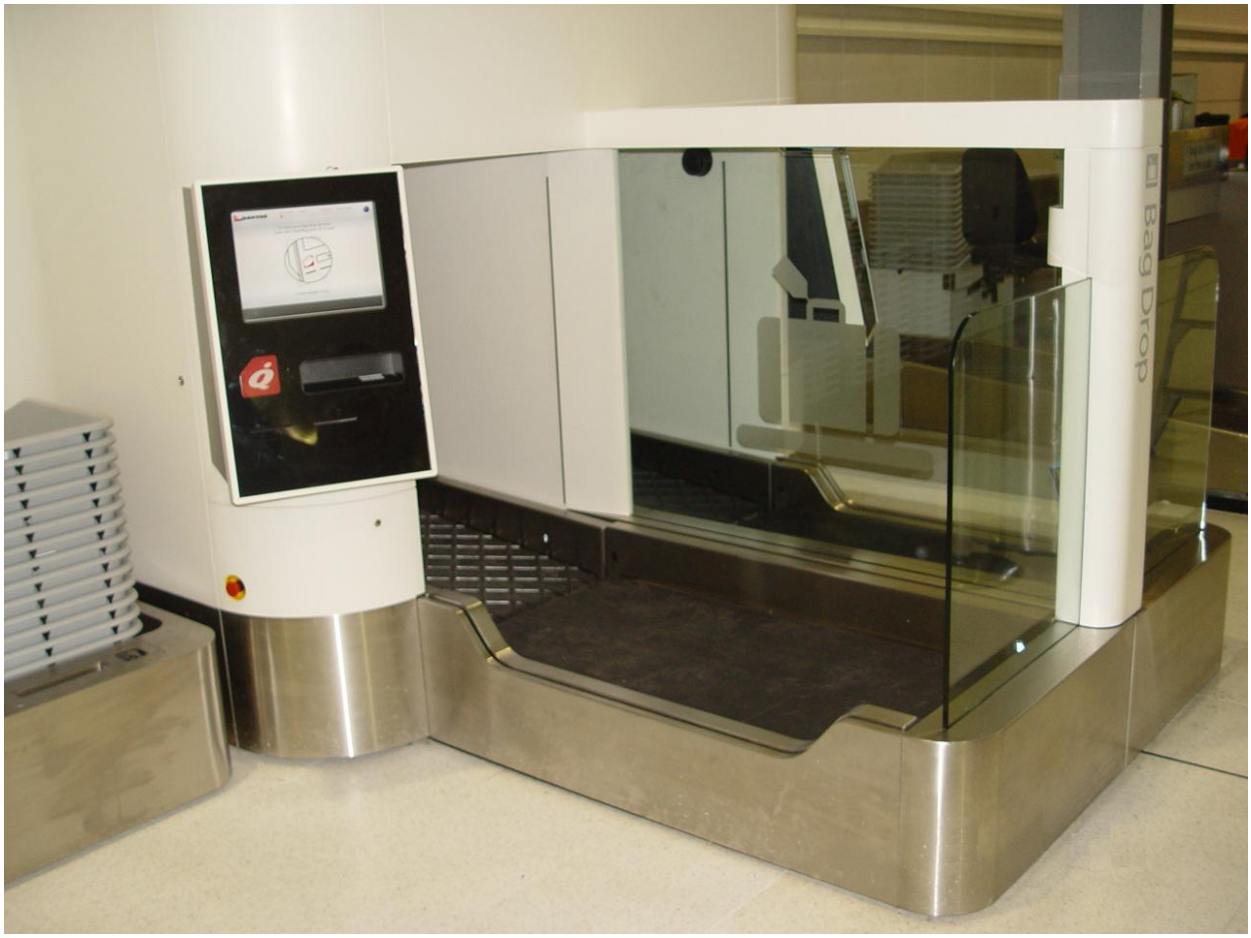
(iii) the luggage weight displayed is the same as the calculated net weight.

4. For a sample transaction (of one piece of luggage resulting in an Excess Baggage Advice), check that when the value of the baggage weight displayed on the Customer Interface Screen is truncated (rounded down to a whole kilogram value) the resulting value is identical to the Checked Baggage weight shown on the Excess Baggage Advice.

5. Check that the automatic zero tracking facility of the Atrax weighing instrument is enabled (e.g. by successively adding 10 small loads of 10 g each and ensuring that the instrument remains at zero).

6. Check that the ‘light curtain’ devices or similar laser or optical sensors are operating (see clause 1.2 (viii) of the Technical Schedule), by attempting to weigh a luggage item whilst holding its handle, and by attempting to weigh a luggage item whilst pushing the item from the side. A warning or error signal should occur.

FIGURE S538 – 1



ICM Model ABD Self ‘Bag-drop’ Control System
for Airline Baggage Weighing

FIGURE S538 – 2

System Overview, some sensors/devices have been omitted

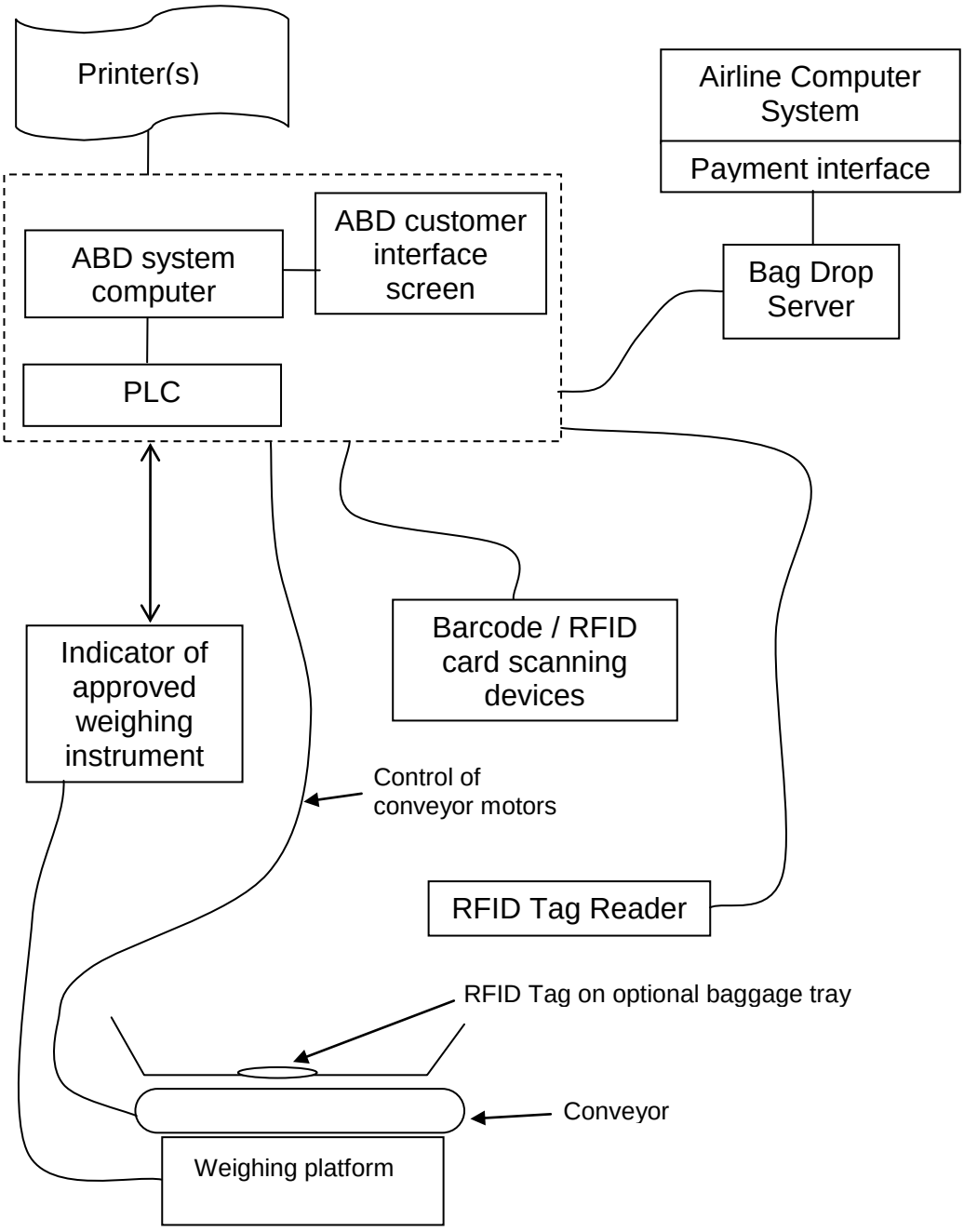


FIGURE S538 – 3

(a)

(b)

Customer Baggage Receipt

Carrier: **QANTAS AIRWAYS**

Issued: **29 MAR 2011 11:43**

Booking Reference: **ZO7R8R**

Name:
BLOGGS/JOEMR

From: **SYDNEY** To: **MELBOURNE**

Flight/s:
QF443 1MAR SYD MEL

Number of Bags: **1**

Bag Tag Number/s:
QF032708 [9999999001385]

QANTAS

(c)

Excess Baggage Advice

Carrier: **QANTAS AIRWAYS**

Issued: **29 MAR 2011 11:43**

Booking Reference: **ZO7R8R**

Name:
BLOGGS/JOEMR

From: **SYDNEY** To: **MELBOURNE**

Flight/s:
QF443 1MAR SYD MEL

Checked Baggage.
2 pieces: total 28 kg

Excess:
Extra Weight 5kg at AUD10.00/kg

Payment Assessment
AUD50.00
Proceed to the:
- Kiosk for credit card payments; or
- Sales Desk for credit card and alternative payment options

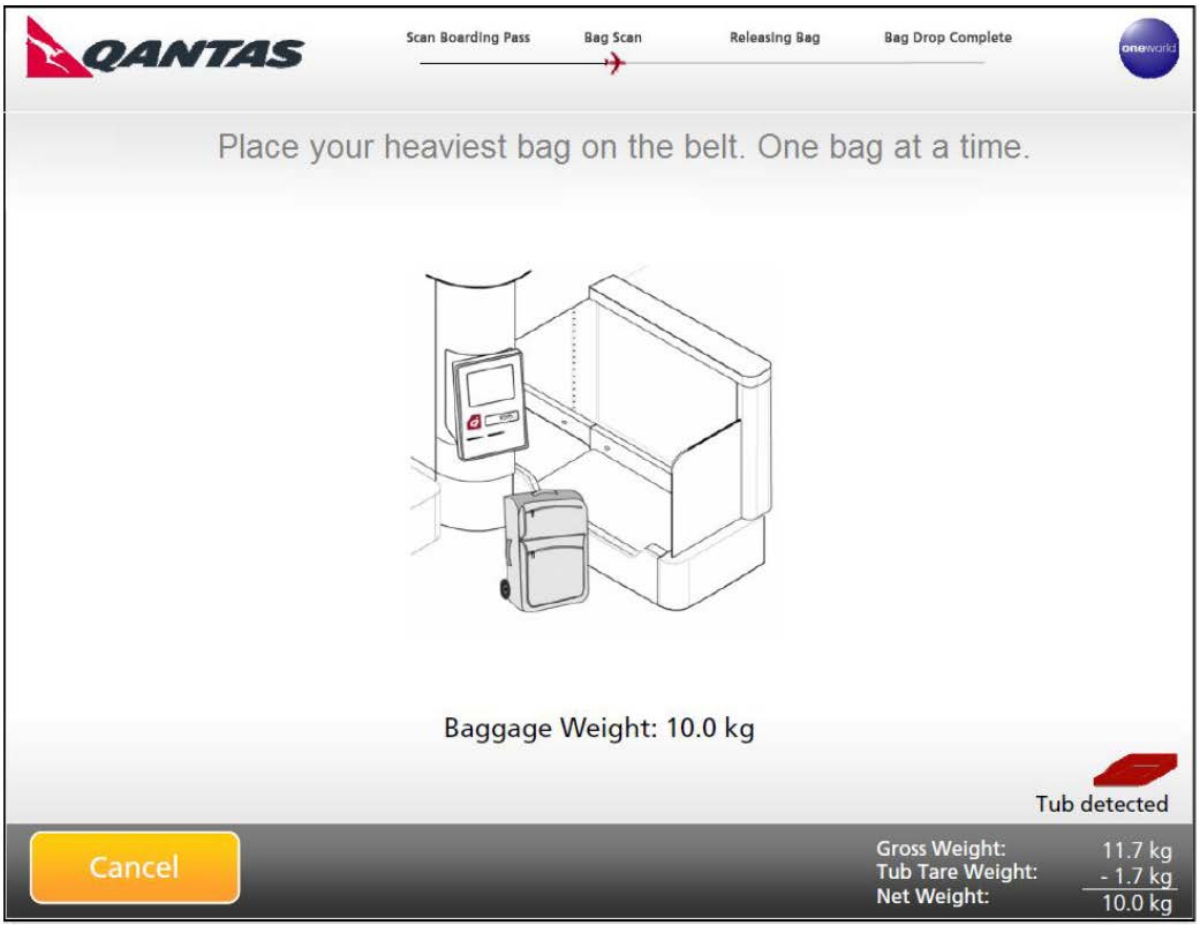
Payment of excess baggage charges must be made prior to boarding

QANTAS

(a) Baggage tag for safety purpose (not for trade use)
(b) Baggage Receipt
(c) Excess Baggage Charges advice

Sample Printouts

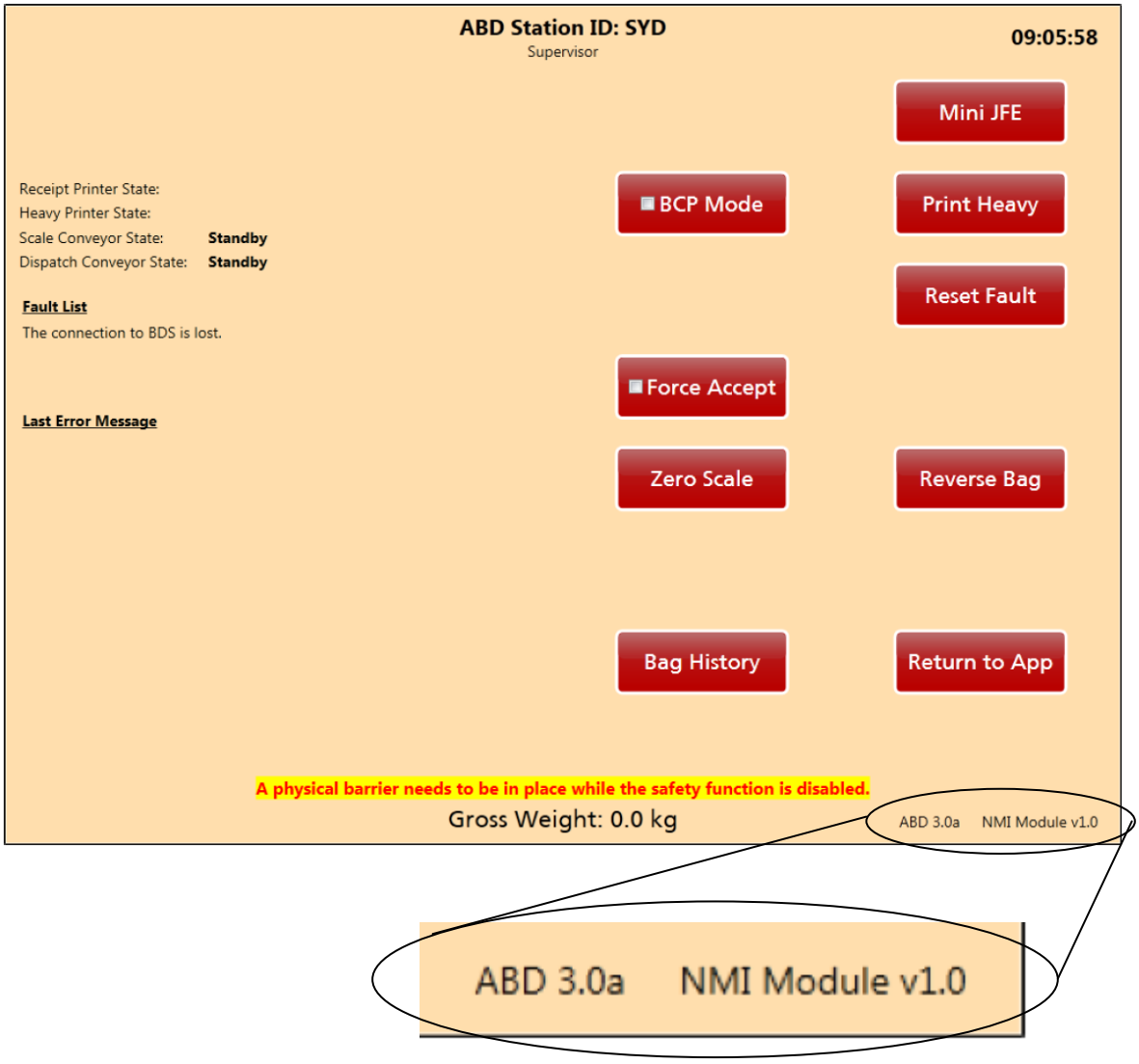
FIGURE S538 – 4



Sample Customer Interface Screen

FIGURE S538 – 5

Similar screens with reduced options are available for other purposes (e.g. without options to Inject Bag or for BCP Mode (business continuity plan – which allows manual operation of the system).



Sample Supervisor Interface Screen

FIGURE S538 – 6

Typical ICM Series 1 ABD System

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