Australian Government

National Measurement
Institute

Bradfield Road, West Lindfield NSW 2070

Cancellation
Certificate of Approval No 6/10B/63

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

This is to certify that the approval for use for trade granted in respect of the

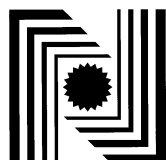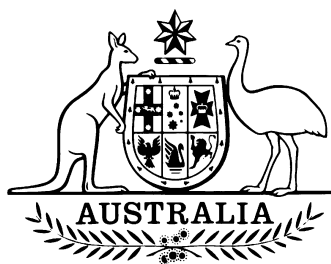Pfister Model SIRIUS Weighing-in-motion Weighing Instrument

submitted by   Pfister Waagen Bilanciai GmbH
                      Stätzlinger Strasse 70
                      D-86165   Augsburg
                      GERMANY.

has been cancelled in respect of new instruments as from 1 August 2008.

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

National Standards Commission

12 Lyonpark Road, North Ryde NSW

Certificate of Approval

No 6/10B/63

Issued 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

Pfister Model SIRIUS Weighing-in-motion Weighing Instrument

submitted by   Pfister Waagen Bilanciai GmbH
Stätzlinger Strasse 70
D-86165   Augsburg
GERMANY.

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.

CONDITIONS OF APPROVAL

This approval becomes subject to review on 1 May 2003, and then every 5 years thereafter.

Instruments purporting to comply with this approval shall be marked NSC No 6/10B/63 and only by persons authorised by the submittor.

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 Commission 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 the Commission's Document NSC P 106.

The Commission reserves the right to examine any instrument or component of an instrument purporting to comply with this approval.

Auxiliary devices used with this instrument shall comply with the requirements of General Supplementary Certificate No S1/0/A.

This approval shall NOT be used in conjunction with General Certificate No 6B/0.

DESCRIPTIVE ADVICE

Pattern: provisionally approved 22 December 1997
approved 15 April 1998

* A Pfister model SIRIUS weighing-in-motion weighing instrument.

Technical Schedule No 6/10B/63 describes the pattern.

Variant: provisionally approved 20 May 1999
approved 9 August 2001

1. A Pfister model SIRIUS WMV8/MVO weighing-in-motion weighing instrument.

Technical Schedule No 6/10B/63 Variation No 1 describes variant 1.

Variant: approved 1 November 2002

2. A Pfister model SIRIUS WMV8/MVO weighing-in-motion weighing instrument with two WMV8 'amplifier cabinets' and three Sirius weighing transducers.

Technical Schedule No 6/10B/63 Variation No 2 describes variant 2.

FILING ADVICE

Certificate of Approval No 6/10B/63 dated 13 August 2001 is superseded by this Certificate, and may be destroyed.

The documentation for this approval now comprises:

Certificate of Approval No 6/10B/63 dated 4 December 2002
Technical Schedule No 6/10B/63 dated 31 May 1999 (incl. Test Procedure)
Technical Schedule No 6/10B/63 Variation No 1 dated 13 August 2001
    (incl. Test Procedure)
Technical Schedule No 6/10B/63 Variation No 2 dated 4 December 2002
Notification of Change No 1 dated 3 October 2002
Figures 1 to 6 dated 31 May 1999
Figure 7 dated 13 August 2001
Figure 8 dated 4 December 2002

Signed by a person authorised under Regulation 60 of the National Measurement Regulations 1999 to exercise the powers and functions of the Commission under this Regulation.

TECHNICAL SCHEDULE No 6/10B/63

Pattern: Pfister Model SIRIUS Weighing-in-motion Weighing Instrument.

Submittor: Pfister Waagen GmbH
Stätzlinger Strasse 70
D-86165   Augsburg
GERMANY.

1.   Description of Pattern

A Pfister model SIRIUS weighing instrument for the determination of the mass of each wagon and hence the total mass of a train, when weighed in motion. The instrument is approved for pulling of wagons only.

1.1   Specifications

Instruments are approved with specifications as set out below:

Accuracy class	
Train weighing	0.5
Wagon weighing	2
Maximum capacity	35 t (17.5 t per rail)
Minimum capacity	1.25 t
Scale interval	50 kg
Maximum wagon weight	140 t
Minimum wagon weight	15 t
Maximum operating speed	15 km/h
Minimum operating speed	1 km/h

1.2   The System

The system includes two Pfister model SIRIUS weighing transducers and a Pfister model DWT 11 indicator.

1.2.1 Weighing Transducers

Two Pfister model SIRIUS weighing transducers are welded into the track. Four clamps, two for each rail, are used to mount the rail on a concrete foundation (Figures 1 and 2). Each rail is machined from a homogeneous piece of steel and is 1.8 m long. A combination of strain gauge measuring sensors are positioned in recesses of the rail.

1.2.2 Indicator

A Pfister model DWT 11 indicator (Figure 3) is used. The indicator is menu driven. To begin weighing in motion mode:

(a)   Turn unit on. 'Zero' (0 t) and the version of software (V 1.0) are displayed.

(b)   Press the [IN] key

(c)   "First Weighing / Second Weighing" is displayed. Select "First Weighing" using the [↔] key then select the [↑↓] key.

(d)   "Train ID" is then displayed. Enter the train identification then select the [↑↓] key.

(e)   "Train Nr" is then displayed. Enter the train number then select the [↑↓] key.

(f)   "Train Nr ... Pull?" is then displayed. If 'pull' is not displayed, use the [↔] key to tab to 'pull', then select the [↑↓] key.

(g)   "Loc-A ..." is then displayed. Enter the number of axles for the locomotive(s) which are pulling the train then select the [↑↓] key.

(h)   "Train ID ..." is displayed.

(i)   To begin weighing select the [IN] key.

Whilst in weighing-in-motion mode the indicator displays weights in 50 kg graduations, however it is not possible to take a stable reading so the weighing result is read from the printout and not the indicator.

Interfacing

A number of serial data interfaces are available and are located inside the DWT 11 indicator. The interfaces are known as X1, X2, X3 and X9. Each interface can be individually configured for use with such devices as an external keyboard, another printer, a remote display, a magnetic card reader or a modem.

1.3   Printer

A printout of the weighing results for the train can be automatically or manually printed at the completion of the weighing operation. Typical printouts are shown in Figure 4). A number of error messages can be printed and these are:

> FD = Inadmissible speed deviation
> FV = Train speed too high
> FL = Train speed too low
> FU = Scale capacity exceeded
> FN = Weighing was done under strong dynamic effects

Where an error is detected, no wagon weight is printed and the error code is printed alongside of where the wagon weight would have been printed.

1.4   Set-Up Adjustment

Preliminary static adjustment of the instrument is carried out using a full reference wagon. One axle is placed at the centre of the rail sensor and the measured value is entered as being 25% of the wagon weight (hence providing a span calibration factor for the unit). However this only provides an approximate weight and this is further refined by using a nominal setting factor determined from dynamic test and which also compensates for the dynamic effects of the train.

It may be necessary to provide different calibration factors at different loads and there is therefore provision for up to three sets of measured values (span calibration factors) and nominal setting factors, each acting over a range of wagon weights.

Where the normal use of an installation involves weighing empty and full wagons it may be necessary to carry out adjustment of the span calibration factor and nominal setting factor for full wagons after adjustments have been carried out with the empty wagons (or vice versa). Such adjustments are permitted and do not significantly affect performance provided the ratio between the weight of the heavy and light wagons is no less than 3:1.

The instrument also has the facility for entering a velocity adjustment factor, which introduces a speed dependent percentage adjustment of the weight values over the speed range of the instrument.

1.5   Track Switches and Programmable Logic Controller

Up to eight Seimens model 3RG4124-3AB00 proximity switches (Figure 2) are connected to a Seimens model S7-200PLC Programmable Logic Controller (Figure 5) and then to the DWT 11 indicator (Figure 3).

The Programmable Logic Controller interprets signals from the proximity switches to enable the DWT 11 indicator to determine the position of the wheel on the weighing transducer, the direction of travel, and if the train has rolled back.

1.6   Verification/Certification Provision

Provision is made for the application of a verification/certification mark.

1.7   Sealing Provision

Provision is made for the cover over the calibration adjustment switches and over the calibration data EPROM in the indicator to be sealed (Figure 6).

1.8 Markings

Instruments bear the following basic markings at each location having a weight indication or printing device:

Manufacturer's name or mark	Pfister Waagen GmbH
Importer's name or mark	Colonial Weighing Australia
Model designation	*SIRIUS*
Serial number of the instrument	....
Pattern approval mark	NSC No 6/10B/63
Accuracy class	
Train weighing	0.5
Wagon weighing	2
Maximum capacity	*Max* .... kg or t
Minimum capacity	*Min* .... kg or t
Scale interval	$d =$ .... kg or t
Maximum wagon weight	.... kg or t
Minimum wagon weight	.... kg or t
Maximum operating speed	v_{max} .... km/h
Minimum operating speed	v_{min} .... km/h

Note: The markings shall reflect details for which the particular installation has been verified. The maximum and minimum wagon weights and maximum and minimum operating speeds may vary from those shown in the specifications (clause 1.1), but shall be within the limits specified there.

TEST PROCEDURE

Instruments shall be tested in accordance with any relevant tests specified in the Inspector's Handbook, but with the maximum permissible errors for weighing-in-motion and the dynamic test procedure modified as follows:

1. Maximum Permissible Errors

The maximum permissible errors for weighing-in-motion shall be:

Wagon Weighing (Accuracy class 2)

The maximum permissible error for dynamic weighing of a coupled wagon during initial verification/certification shall be:

(a) ±1% of the wagon weight, rounded to the nearest scale interval;

(b) ±1%, rounded to the nearest scale interval, of the weight of a single wagon equal to 35% of the maximum wagon weight as inscribed on the descriptive markings; or

(c) ± one scale interval,

whichever is the greatest.

Errors of not more than 10% of the weighing results, taken from one or more passes of the test train, may exceed $\pm1\%$ but shall not exceed $\pm2\%$ of the wagon weight.

Train Weighing (Accuracy class 0.5)

The maximum permissible error for dynamic weighing of a train of coupled wagons during initial verification/certification shall be:

(a) $\pm0.25\%$ of the total train weight, rounded to the nearest scale interval;

(b) $\pm0.25\%$, rounded to the nearest scale interval, of the weight of a single wagon equal to 35% of the maximum wagon weight as inscribed on the descriptive markings, times the number of wagons in the train but not exceeding 10 wagons; or

(c) $\pm$ one scale interval for each wagon in the train, but not exceeding 10 scale intervals,

whichever is the greatest.

In-service Errors

The maximum permissible errors applicable in-service are twice the values for initial verification/certification, namely:

(a)   wagon weighing $\pm2\%$ of the wagon weight; and

(b)   train weighing $\pm0.5\%$ of the total train weight.

2.   Dynamic Test Procedure

The dynamic test procedure and the number of test wagons in the test train are detailed below.

Test Train

The types and number of wagons shall be in accordance with the normal operation of the instrument provided that the number does not exceed 60.

The test train shall be made up of test wagons and normal operational wagons. The wagons shall be loaded to represent the loads weighed by the weighing instrument. If the loads vary, then wagons full, partially filled, and empty shall be used as applicable.

Number of Test Wagons

Each test train shall have not less than five and not normally more than 15 test wagons in accordance with the table below.

Total number of wagons in test train (n)	Minimum number of test wagons
$n \leq 10$	n
$10 < n \leq 30$	10
$30 < n$	15

If the number of test wagons is less than the total number of wagons in a test train, the test wagons shall be distributed evenly throughout the train.

3.   Performance Requirements

The test train shall be weighed repeatedly to yield not less than 60 wagon weights or their equivalent in total train weight. Every weight indication and printout shall comply with the maximum permissible errors.

If applicable, repeat the tests for other speeds including minimum and maximum speeds, other directions of travel, or other entry or exit tracks to or from the weighing instrument.

4.   Other Tests

Carry out tests to check the correct operation of the instrument (including printed record) for:
- over or under speed;
- over weight;
- roll back; and
- calculations (net weight, totals).

TECHNICAL SCHEDULE No 6/10B/63

VARIATION No 1

Pattern: Pfister Model SIRIUS Weighing-in-motion Weighing Instrument.

Submittor: Pfister Waagen GmbH
Stätzlinger Strasse 70
D-86165   Augsburg
GERMANY.

1.   Description of Variant 1

The Pfister model SIRIUS WMV8/MVO instrument with a Pfister model WMV8 'amplifier cabinet' (Figure 7) and a Random Computers personal computer with Sirius MVO software.

The instrument uses the weighing transducers of the pattern however the DWT11 indicator is replaced by the WMV8 amplifier cabinet and personal computer.

The WMV8 amplifier cabinet samples weight data from the weighing transducers which is then provided to the personal computer which uses the Sirius MVO software to analyse the data and provide final weight information.

Information from the weighing transducers is used for wagon identification purposes and track switches are not required.

1.1   WMV8 Amplifier Cabinet

The Pfister model WMV8 amplifier performs the following functions during the weighing operation:

- Supplies excitation voltage to the weighing transducers;

- Amplifies the transducer signal and performs analogue to digital conversion;

- Stores the acquired weight data from the weighing transducers;

- Transmits speed information to the Sirius MVO software during the weighing operation;

- Performs data analysis of the stored weight information from the weighing transducers (applying filtering algorithms and correction factors – see clause **1.4 Calibration Process and Calibration Factors**) after completion of the train weighing;

- Forms a set of data representing the axle weights and distances; and

- Outputs this set of data to the Sirius MVO software running on a personal computer.

The WMV8 amplifier has eight input channels. This provides for the connection of up to four Sirius weigh rail transducers (i.e. up to two pairs).

1.2 Personal Computer

The instrument uses a Random Computers personal computer running Sirius MVO software under the Microsoft Windows 98 or Microsoft Windows NT version 4.0 operating system.

1.3 Sirius MVO Software

The Sirius MVO software provides the operator interface of the instrument. In addition the software performs the following functions during the weighing process:

- Uses speed information provided by the WMV8 amplifier cabinet during the weighing process to provide speed indications such as warning of over-speed;

- Receives the set of data representing the axle weights and distances from the WMV8 amplifier cabinet;

- Matches the axle weight and distance data with information regarding the particular train configuration (if available). This information may be obtained from a supplied train list, or wagon identification system;

- Forms wagon weights from the axle weight data; and

- Provides reports.

The Sirius MVO software has facilities for management of train information in addition to the weighing operation. The system utilises a Microsoft Access database system to maintain these records. The primary indication of the instrument is considered to be the weighing printout (accessed by selecting the *Print Weighing Report* button on the form accessed through the *Reports Weighing Report* menu).

1.4 Calibration Process and Calibration Factors

Filtering algorithms and correction factors are applied to weight data sampled from the weighing transducers. Parameters involved in this process are stored in a calibration configuration data file stored within the WMV8 amplifier cabinet.

In the calibration of an installation the calibration configuration data file is produced in a process involving the following:

- A standard 'factory' configuration data file is written into the WMV8 amplifier cabinet;

- Reference wagon weights of the test train are entered into a reference wagon data file;

- The test train is run over the weighbridge (a number of times) in the directions and speed ranges required;

- For each run, the raw weight data obtained by the WMV8 indicator is stored in a separate data file;

- The data obtained, together with the reference wagon data file, is analysed by data analysis software provided by Pfister to generate a calibration configuration data file for the installation;

- The calibration configuration data file is loaded into the instrument via a dedicated calibration serial interface port of the WMV8 amplifier cabinet; and

- The calibration serial interface port of the WMV8 amplifier cabinet is sealed to prevent alteration of the calibration configuration data file.

1.5   System Specifications

In-situ performance can depend on site conditions and train configuration. It may therefore be necessary following in-situ testing (and in the light of results obtained) to restrict the range of operation in ways such as:

- Limiting the maximum and minimum wagon weights;

- Limiting the allowable speed range(s); or

- A combination of both the above.

Such restrictions shall be marked on the nameplate of the instrument and where operation occurs outside the acceptable range(s), weight values should not be shown and an error message should appear (similar to an 'overspeed' message).

Variant 1 instruments may have differing specifications as noted above, but shall be within the limits shown below:

Accuracy class		
Train weighing		0.5, 1 or 2
Wagon weighing		1 or 2
Maximum capacity		35 t per axle
Minimum capacity		3 t per axle
Scale interval		50 kg
Maximum wagon weight		No. of axles x 35 t (or less)
Minimum wagon weight		No. of axles x 3 t (or more)
Maximum operating speed		15 km/h
Minimum operating speed		2.5 km/h

1.6   Sealing Provision

Alteration of the calibration configuration data file is to be prevented. To achieve this the calibration serial interface port (marked 'A2' or 'Einmess') of the WMV8 amplifier cabinet is sealed (without any cable connected to it), as is the cover which may provide access to the rear of the interface ports. In addition, access within the WMV8 amplifier cabinet (the small cabinet containing a display and keypad within the larger cabinet) is sealed by use of destructible adhesive label(s). See Figure 7.

1.7 Markings

Instruments bear the following markings at each location having a weight indication or printing device.

Manufacturer's name or mark	….
Importer's name or mark	….
Model designation	….
Serial number of the instrument	….
Pattern approval mark	NSC No 6/10B/63
Accuracy class	
Train weighing	……
Wagon weighing	……
Maximum capacity	Max (axle) …… t
Minimum capacity	Min (axle) …… t
Scale interval	d = …… kg
Maximum wagon weight	No. of axles $\times$ …… t
Minimum wagon weight	No. of axles $\times$ …… t
Maximum operating speed	v_{max} = …… km/h
Minimum operating speed	v_{min} = …… km/h

The markings shall reflect details for which the particular installation has been verified. The maximum and minimum wagon weights and maximum and minimum operating speeds may vary from those shown in the specifications (clause 1.5) but shall be within the limits specified there. For example, the maximum wagon weight will be related to the heaviest reference wagon used; the Commission should be consulted for guidelines regarding this.

Note 1: It is acceptable for more complex sets of markings to be provided. This may be necessary where (for example) it was necessary following in-situ testing to restrict operation to one speed range for wagon weighing and another speed range for train weighing. Such arrangements shall be clearly set out in the markings provided.

Note 2: Where an installation is only to be used with wagons of a particular configuration (e.g. all with 4 axles), the maximum and minimum wagon weight values may be expressed as a value rather than the formula shown in the example.

TEST PROCEDURE

Instruments shall be tested in accordance with the clauses **2.**, **3.** and **4.** of the Test Procedure included as part of Technical Schedule No 6/10B/63 dated 31 May 1999, with the maximum permissible errors as follows:

1.   Maximum Permissible Errors

The maximum permissible errors for weighing-in-motion shall be:

(a)   Dynamic Weighing

The maximum permissible error for dynamic weighing of a coupled wagon during initial verification/certification shall be:

(a)   ±N% of the wagon weight, rounded to the nearest scale interval;

(b)   ±N%, rounded to the nearest scale interval, of the weight of a single wagon equal to 35% of the maximum wagon weight as inscribed on the descriptive markings; or

(c)   ± one scale interval,

whichever is the greatest, where

> N = 0.10 for accuracy class 0.2;
>
> N = 0.25 for accuracy class 0.5;
>
> N = 0.50 for accuracy class 1; and
>
> N = 1.00 for accuracy class 2.

Errors of not more than 10% of the weighing results, taken from one or more passes of the test train, may exceed the maximum permissible error but shall not exceed two times that value.

(b)   In-service Errors

The maximum permissible errors applicable in-service are twice the values for initial verification/certification.

TECHNICAL SCHEDULE No 6/10B/63

VARIATION No 2

Pattern: Pfister Model SIRIUS Weighing-in-motion Weighing Instrument.

Submittor: Pfister Waagen Bilanciai GmbH
Stätzlinger Strasse 70
D-86165   Augsburg
GERMANY.

## 1.   Description of Variant 2

The Pfister model SIRIUS WMV8/MVO instrument similar to variant 1 but using two Pfister model WMV8 'amplifier cabinets' connected to three SIRIUS weighing transducers, one in each rail of a dual gauge rail system. The weighing transducer in the rail common to both rail gauges is 'shared' between the two WMV8 systems (Figure 8).

The power supply to the two WMV8 'amplifier cabinets' shall be arranged so that both units are always on (or off) together, i.e. the use with only one WMV8 unit powered on is not approved.

The two WMV8 systems are to be verified/certified (tested) separately and are connected to a single personal computer with MVO software.

The SIRIUS WMV8/MVO instrument, the MVO software and a test procedure are all described in Technical Schedule No 6/10B/63 Variation No 1 dated 13 August 2001.
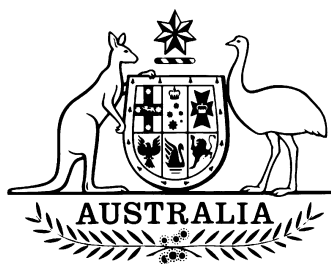
National Standards Commission

12 Lyonpark Road, North Ryde NSW

Notification of Change

Certificate of Approval No 6/10B/63

Change No 1

The following change is made to the approval documentation for the

Pfister Model SIRIUS Weighing-in-motion Weighing Instrument

submitted by   Pfister Waagen GmbH
Stätzlinger Strasse 70
D-86165   Augsburg
GERMANY.

In Certificate of Approval No 6/10B/63 and its Technical Schedule both dated 13 August 2001, all references to the submittor should be amended to read:

Pfister Waagen Bilanciai GmbH

Signed by a person authorised under Regulation 60 of the National Measurement Regulations 1999 to exercise the powers and functions of the Commission under this Regulation.

Australian Government

National Measurement
Institute

12 Lyonpark Road, North Ryde NSW 2113

Notification of Change
Certificate of Approval No 6/10B/63
Change No 2

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

The following change is made to the approval documentation for the

Pfister Model SIRIUS Weighing-in-motion Weighing Instrument

submitted by   Pfister Waagen Bilanciai GmbH
Stätzlinger Strasse 70
D-86165   Augsburg
GERMANY.

In Certificate of Approval No 6/10B/63 dated 4 December 2002, the Condition of
Approval referring to the review of the approval should be amended to read:

"This approval becomes subject to review on 1 May 2008, and then every
5 years thereafter."

Signed by a person authorised by the Chief Metrologist
to exercise his powers under Regulation 60 of the
National Measurement Regulations 1999.
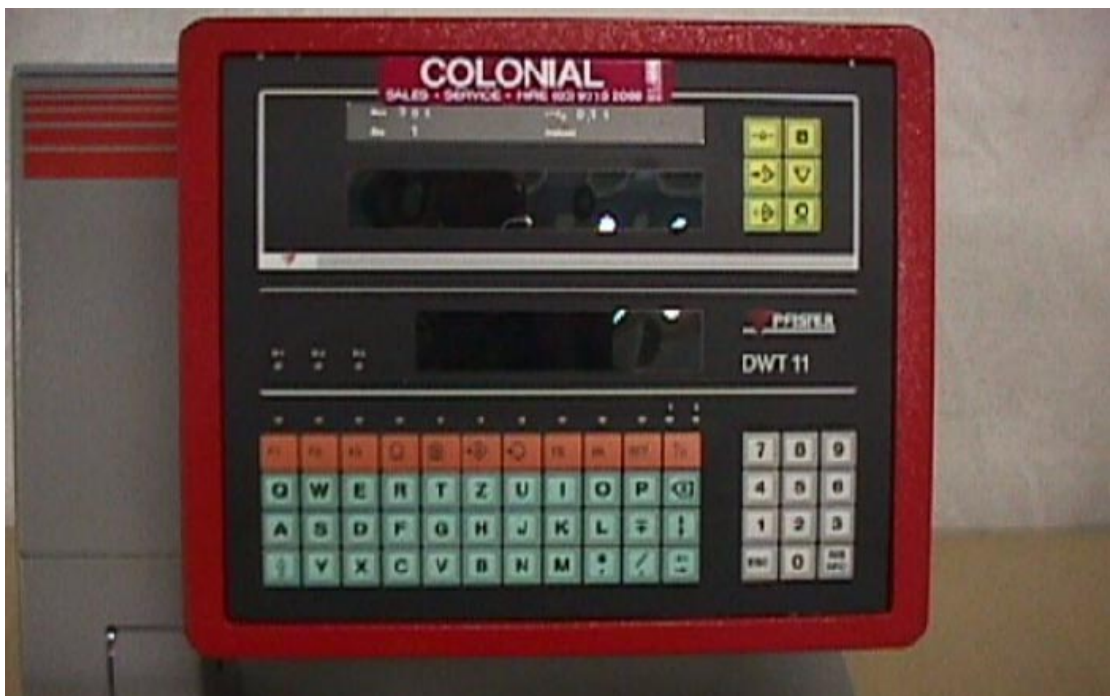
FIGURE 6/10B/63 - 1

Pfister Model SIRIUS Weighing Transducers

FIGURE 6/10B/63 - 2

Weighing Transducers, Mounting Clamps and Track Switches

FIGURE 6/10B/63 - 3

Pfister Model DWT 11 Indicator

FIGURE 6/10B/63 - 4

10.02.99   08:47   Train No 1   000001

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	ser. no	Waggonnumber	Products	1st weight	2nd weight	
1001	001196			G 028,40t	T 000.00t	N 028,40t
1002	001197			G 027,60t	T 000,00t	N 027,60t
1003	001198			G 026,70t	T 000,00t	N 026,70t
1004	001199			G 027,70t	T 000,00t	N 027,70t
[... DETAILS OMITTED FOR CLARITY]						
1021	001216			G 028,70t	T 000,00t	N 028,70t
1022	001217			G 029,50t	T 000,00t	N 029,50t
1023	001218			G 027,30t	T 000,00t	N 027,30t

Waggons: 023   Train-total 000581.20t

An example of a printout without any error messages

10.02.99   10.23   Train No 2   000001

----

	ser. no	Waggonnumber	Products	1st weight		2nd weight	
2001	000120			G 068,10t		T 000.00t	N 068,10t
2002	000121			G 067,60t		T 000,00t	N 067,60t
2003	000122			G 066,70t		T 000,00t	N 066,70t
2004	000123				FD	T 000,00t	
[... DETAILS OMITTED FOR CLARITY]							
2013	000132			G 068,70t		T 000,00t	N 068,70t
2014	000133				FV	T 000,00t	
2015	000134			G 067,40t		T 000,00t	N 067,40t

Waggons: 015   Train-total

An example of a printout including error messages

Typical Printouts

FIGURE 6/10B/63 - 5

Seimens Model S7-200PLC Programmable Logic Controller
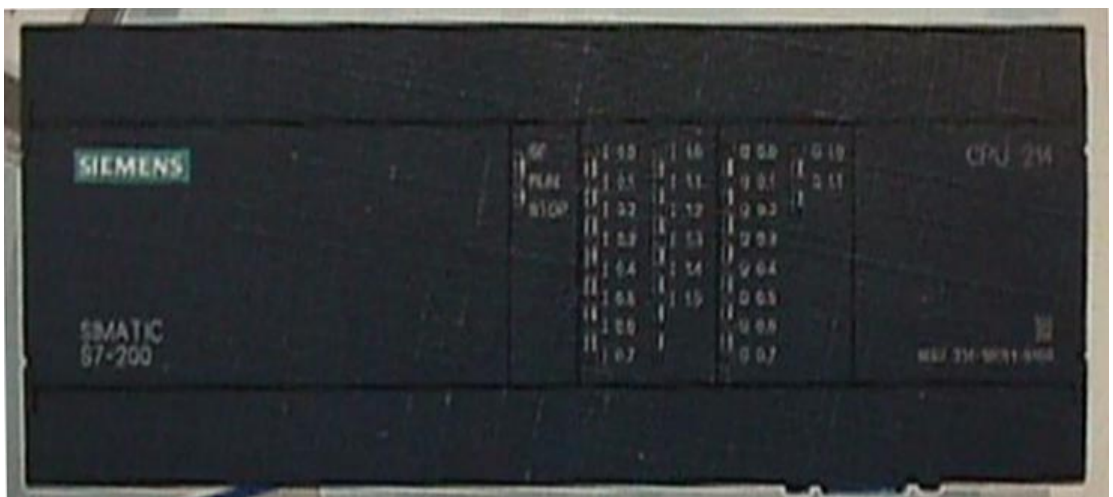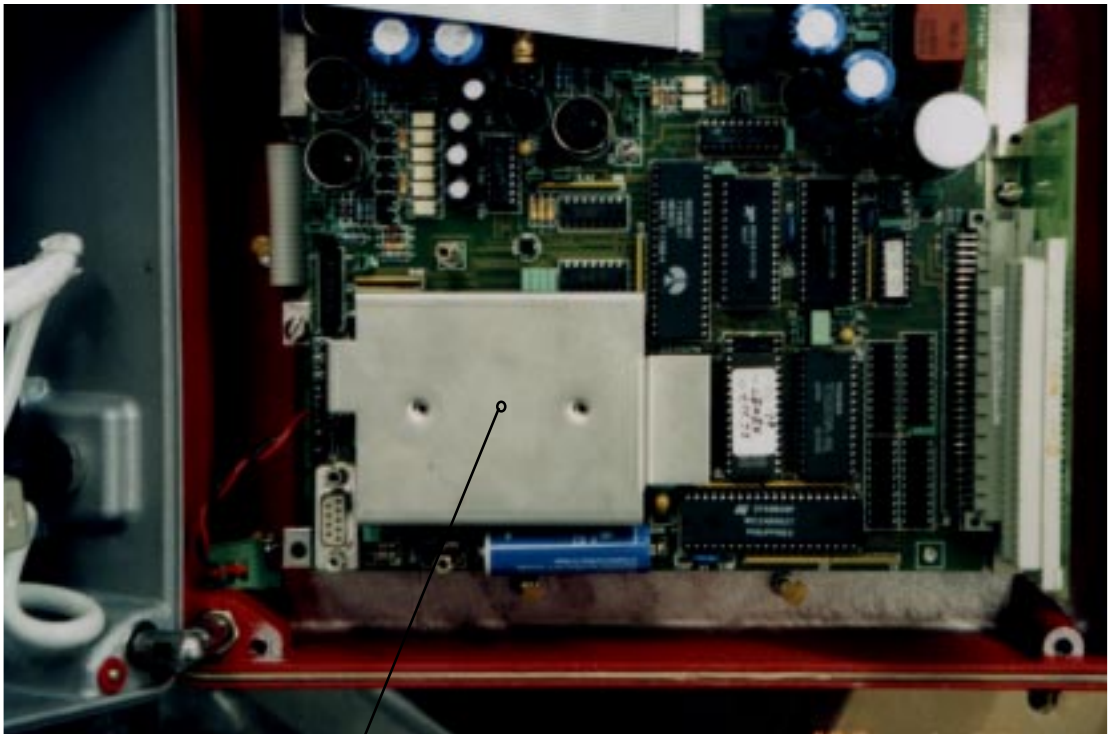
FIGURE 6/10B/63 - 6

Cover to be sealed

Showing Sealing

FIGURE 6/10B/63 - 7

AMPLIFIER CABINET
AND SERIAL PORT
TO BE SEALED

Pfister Model WMV8 'Amplifier Cabinet'

FIGURE 6/10B/63 - 8

transducer

transducer

transducer

WMV8

WMV8

Both WMV8 Amplifiers must be switched on
when the system is in use

PC
with
MVO
Software

Pfister Model WMV8 Dual Amplifier/Dual Gauge Rail System - Variant 2