Australian Government
Department of Industry, Science and Resources

National Measurement Institute

36 Bradfield Road, West Lindfield NSW 2070

Certificate of Approval
NMI 6/20A/15

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.

Caterpillar Model N8N Wheeled Loader Weighing Instrument

submitted by Caterpillar Inc.
100 NE Adams Street
Peoria
Illinois 61629
USA

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 has been granted with reference to document NMI R 51, *Automatic Catchweighing instruments,* dated August 2009.

This approval is subject to review at the decision of the Chief Metrologist in accordance with the conditions specified in the document NMI P 106.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variant 1 approved – interim certificate issued	28/07/25
1	Pattern & variant 1 approved and variant 2 approved – certificate issued	23/12/25

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI 6/20A/15' 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 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.

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

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

Special Conditions of Approval:

For this type of instrument, the ability to perform within the specified maximum permissible errors can depend substantially on characteristics of the wheeled loader to which it is fitted. Some designs of wheeled loaders simply may not be suitable for attachment of this weighing instrument, however the National Measurement Institute is unable to clearly define particular wheeled loaders, or categories of wheeled weighers, for which the instrument is unsuitable.

It is the responsibility of the submittor (Caterpillar) to exercise control over any installation to ensure compliance with this approval and to ensure performance within the appropriate maximum permissible errors.

In the event of unsatisfactory performance this approval may be withdrawn.

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

Darryl Hines
Manager
Policy and Regulatory Services

TECHNICAL SCHEDULE No 6/20A/15

1. Description of Pattern approved on 28/07/25

The Caterpillar model N8N Advanced class Y(b) automatic catchweighing instrument (Figures 1a and 1b) of 10 500 kg maximum capacity with a verification scale interval of 50 kg and a minimum capacity of 1000 kg fitted to a Caterpillar model CAT 966 wheeled loader.

The Caterpillar model N8N automatic catchweighing instrument comprises electronic equipment and sensors attached to a wheeled loader (i.e. typically 'front end loader') which automatically determine the load lifted by the lifting mechanism of the loader during the lifting process. Figure 1a shows a typical installation.

The electronic equipment and sensors are described below.

Instruments may be fitted with output sockets (output interfacing capability) for the connection of auxiliary and/or peripheral devices.

1.1 Pressure Sensor(s)

Two (2) Caterpillar Part No. 349-1178 or 592-5298 pressure sensors (Lift Cylinder Rod End and Head End) of 500 bar maximum range are used (Figure 2). The pressure sensors measure the pressure acting on the piston in the lift cylinder(s),

In addition two (2) Caterpillar Part No. 349-1178 or 592-5298 tilt pressure sensors are installed for control assistance features (Advanced model only. Note: These tilt pressure sensors are not used for weighing).

1.2 Temperature Sensor

The Caterpillar Part No. 256-6453 temperature sensor (Figure 3) is used to determine if a new zero setting is required prior to the 15-minute periodic zero-setting request.

1.3 Boom Angle Sensor

A Caterpillar Part No. 266-2337 or 539-6653 rotary position sensor (Figure 4a) mounted to the vehicle frame and linked to the booms measure the angular position of the booms relative to the vehicle frame. The correct position for a weight determination is when the loading arm is passing within a weighing zone.

1.4 Load Receptor (Bucket) Location Sensor

A Caterpillar Part No. 266-2337 or 539-6653 rotary position sensor (Figure 4b) is located on the boom to detect when the load receptor (bucket) is in the correct location (i.e. the bucket is fully rotated 'crowded' back, so that the load will fall into the centre of the bucket). The system will inhibit weighing if the load receptor is not in this location.

1.5 Chassis Inclination Sensor

A Caterpillar Part No. 563-0598 or 596-7347 or 616-4042 inertial measurement sensor attached to chassis of the vehicle (Figure 5) detects the degree to which the vehicle is tilted from its reference (level) condition, and allows the system to disable weight determination if 5 degrees of tilt is exceeded. A warning message is displayed stating 'Payload Overload Limit Exceeded'.

1.6 Analysis Module

A Caterpillar Part No. 494-6473 analysis module mounted in the cab of the vehicle (Figure 6) reads sensor data (boom angle sensor, bucket location sensor and pressure sensors on the standalone model) and performs all measurement calculations.

1.7 Implement ECM (Electronic Control Module)

The Caterpillar Part No. 491-6843 Implement ECM (Electronic Control Module) mounted in the cab of the vehicle (Figure 7) reads sensor data (boom angle sensor, bucket location sensor, pressure sensors, temperature etc.) and sends the data to the analysis module via the machine CAN/J1939 data link for measurement calculations (Advanced model only).

1.8 Display Unit

The Caterpillar Part No. 584-5631 graphical display unit (Figure 8) has an LCD touchscreen display on which the weighing results as well as instructions, alarm or error messages are displayed.

1.9 Printer Unit

A Caterpillar model production measurement onboard printing unit (Figure 9) is connected to the Caterpillar Analysis Module and can print load tickets automatically or by manual command.

The printout will print information to identify the particular ‘delivery’ (a unique job number, time and date), the weight value of a single load (lift) or a total of the loads. Additional information may also be printed (product description, customer name, etc).

The instrument includes provision for electronic storage of the weight value of each load (lift) to permit checking of it in the case of dispute.

Note: A Caterpillar model production measurement onboard printing unit is a typical example only – other model printers may be used.

1.10 Additional Features

The system has certain additional functions:

- A function in which a particular target total weight is set. The material is delivered (e.g. loaded into a truck) by a number of lifts, and after each lift the display provides an indication of the material still to be delivered to obtain the target total weight.
- A totalisation facility.
- An ‘auto enter’ facility allowing each weight value to be automatically accepted (added to total and printed).
- A ‘live last bucket’ facility allowing adjustment of the final lift quantity. Once the quantity has been adjusted the load receptor must be lowered and re-lifted before the weight value is entered.
- Provision for storage of customer details.
- Provision for storage of product details.
- Provision for storage of pre-set target total values.

- Provision for storage of batch data (e.g. recipes of various target totals of different products.
- A Cat Product Link device (optional) may be provided. The Product Link device acts as a gateway to enable communications with offboard services.

The instrument may have other additional functions. These functions (other than the indications of measured mass - i.e. gross, tare, net, totals - displayed either on the indicator or on an auxiliary or peripheral device), are not approved for trade use.

1.11 Alternative Load Receptors

It is possible for the system to be calibrated with a number of different load receptors (i.e. different attachments to the lifting system). The system shall be verified for each different load receptor, and clear identification of the attachment shall be provided and shall correspond to the identification of the attachment in use which is indicated at the Caterpillar model N8N control and display unit.

Use with load receptors other than those with which the system has been verified is not approved.

1.12 Power Supply

The instrument is powered by the vehicle power supply (battery) of 24 V DC.

1.13 Zero

The initial zero-setting device has a nominal range of not more than 20% of the maximum capacity of the instrument.

The instrument has a (dynamic) semi-automatic zero-setting device with a nominal range of not more than 4% of the maximum capacity of the instrument.

After the initial zero-setting operation during the power on process, subsequent zero-setting operations, with a nominal range of not more than 4% of the maximum capacity of the instrument, may be selected through the menu system, or it may be requested automatically by the system (e.g. after completion of a delivery, or after a number of lifts have been carried out without zeroing, or after switching on). The zero-setting must be repeated every 15 minutes.

Zero is set (to within ±0.25e) by raising the empty load receptor (according to instructions on the display). When zero has been set, the normal weighing mode screen is displayed.

1.14 Interfaces

The instrument may be fitted with interfaces for the connection of auxiliary and/or peripheral devices. Any interfaces shall comply with clause 4.2.4 of document NMI R51 (the basic intent of which is that it shall not be possible to alter weighing results via the interfaces).

Any measurement data output from the instrument or its interfaces shall only be used for trade in compliance with NMI General Supplementary Certificate Approval No S1/0B (in particular in regard to the data and its format).

Indications other than the indications of measured mass (i.e. gross, tare, net, totals) displayed either on the indicator or on an auxiliary or peripheral device, are not for trade use.

Instruments may be fitted with interfaces with Ethernet, USB and CAN.

1.15 Verification Provision

Provision is made for the application of a verification mark.

1.16 Descriptive Markings and Notices

Instruments carry the following markings:

Manufacturer's mark, or name written in full	Caterpillar Inc.
Indication of accuracy class	Y(b)
Pattern approval mark for the instrument	NMI 6/20A/15
Maximum capacity	*Max* ..... t #1
Minimum capacity	*Min* ..... t #1
Verification scale interval	*e* = ... t #1
Serial number of the instrument	.....

#1 These markings shall also be shown in the electronic markings field above the display of the result.

1.17 Software

The legally relevant software version is designated 4.1.x, where 'x' represents the date of non-legally relevant software change. Date '10Jan2015' or later is acceptable.

The instructions for accessing the legally relevant version are as follows (starting from the normal weighing mode):

- Press the  'Menu' button. The main menu screen is displayed.
- Press the  'Service' button.
- Press the 'Payload for Trade' button, then press the 'Summary' button.
- Press the 'Software Version'. The software version and number are displayed.

1.18 Sealing Provision

Provision is made for the calibration adjustments to be sealed.

- The pressure sensors, position sensors, temperature sensor, chassis inclination sensor, analysis module and implement control module shall be sealed by recording the serials numbers in the N8N to seal against replacement.

  Evidence of alteration of the sensor is provided by an audit trail. The audit trail records each change to the sensor and its parameters, including all information from the creation to the latest modifications.

  Access to the audit trail may be obtained by the following procedure:

  a) In the normal weighing mode, press the  'Menu' button. The main menu screen is displayed.

  b) Press the  'Service' button. The service menu is displayed.

  c) Press the 'History' button. The sealed status and event logger are displayed.

- The instrument is sealed by recording the audit trail counter on verification.

Access to allow changing of calibration parameters must be protected by a passcode.

The instrument automatically increments a calibration value (audit trail number) each time the instrument is calibrated.

The value of the counter may be recorded on a destructible adhesive label attached to the instrument (e.g. as Seal Identifier x). Any subsequent alteration to the calibration or configuration will be evident as the recorded value and the current counter value will differ.

The instructions for accessing the event counter are as follows:

a) Press the  'Menu' button. The main menu screen is displayed.

b) Press the 

'Service' button.

c) Press the 'Payload for Trade' button, then press the 'Summary' button.

d) The event counter (Seal Identifier) is displayed (Figure 10).

2. Description of Variant 1 approved on 28/07/25

The Caterpillar model N8N class Y(b) automatic catchweighing instrument similar to the pattern but fitted to different Caterpillar wheeled loaders which may also have different maximum capacities.

Instruments are approved for use with up to 160 verification scale intervals.

3. Description of Variant 2 approved on 23/12/25

The Caterpillar model N8N Standalone class Y(b) automatic catchweighing instrument which is similar to the pattern and variant 1 but with a number of minor differences including the absence of Caterpillar Part No. 349-1178 tilt pressure sensors installed (Figures 1a and 1c).

3.1 Software

The legally relevant software version is designated 4.0.x, where 'x' represents the date of non-legally relevant software change. Date '10Jan2015' or later is acceptable.

Instruments shall be tested in accordance with any relevant tests specified in the National Instrument Test Procedures NITP 6.8: Wheeled Loader.

Maximum Permissible Errors

The maximum permissible errors are specified in Schedule 1 of the *National Trade Measurement Regulations 2009*.

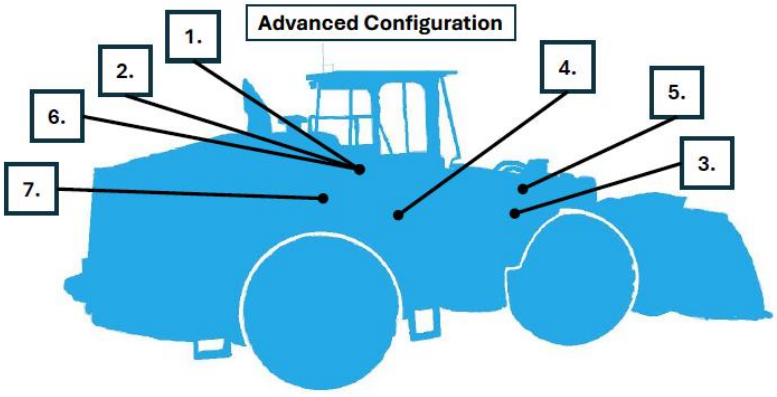
Additional Tests

Totalisation of the loads shall be checked by comparison with the individual measurement values stored in the integral electronic storage device.

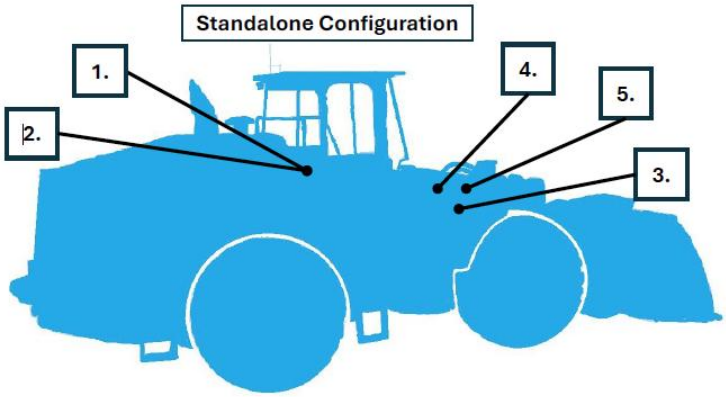
Carry out five measurements on the instrument and print a ticket.

The value printed on the ticket shall equal the arithmetic sum of the measurement values retrieved from the electronic storage device and displayed on the instrument being summed.

FIGURE 6/20A/13 – 1

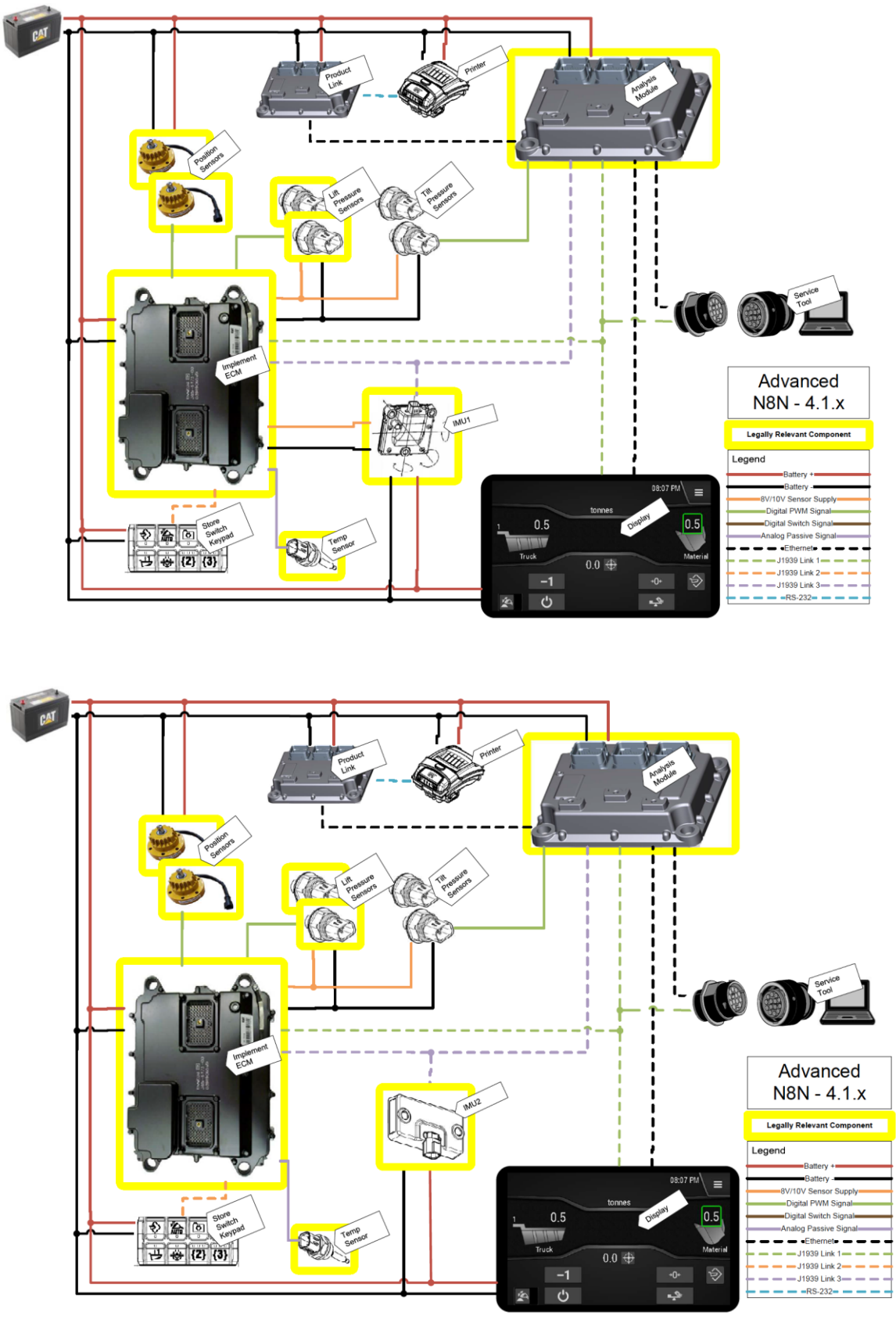


1. *Descriptive Markings Film*
2. *Analysis Module*
3. *Pressure Sensors (Lift Cylinder – Rod and Head End)*
4. *IMU (Inertial Measurement Sensor)*
5. *Rotary Position Sensors (Lift and Tilt Linkage Position Sensors)*
6. *Implement ECM (Electronic Control Module)*
7. *Hydraulic Oil Temperature Sensor*

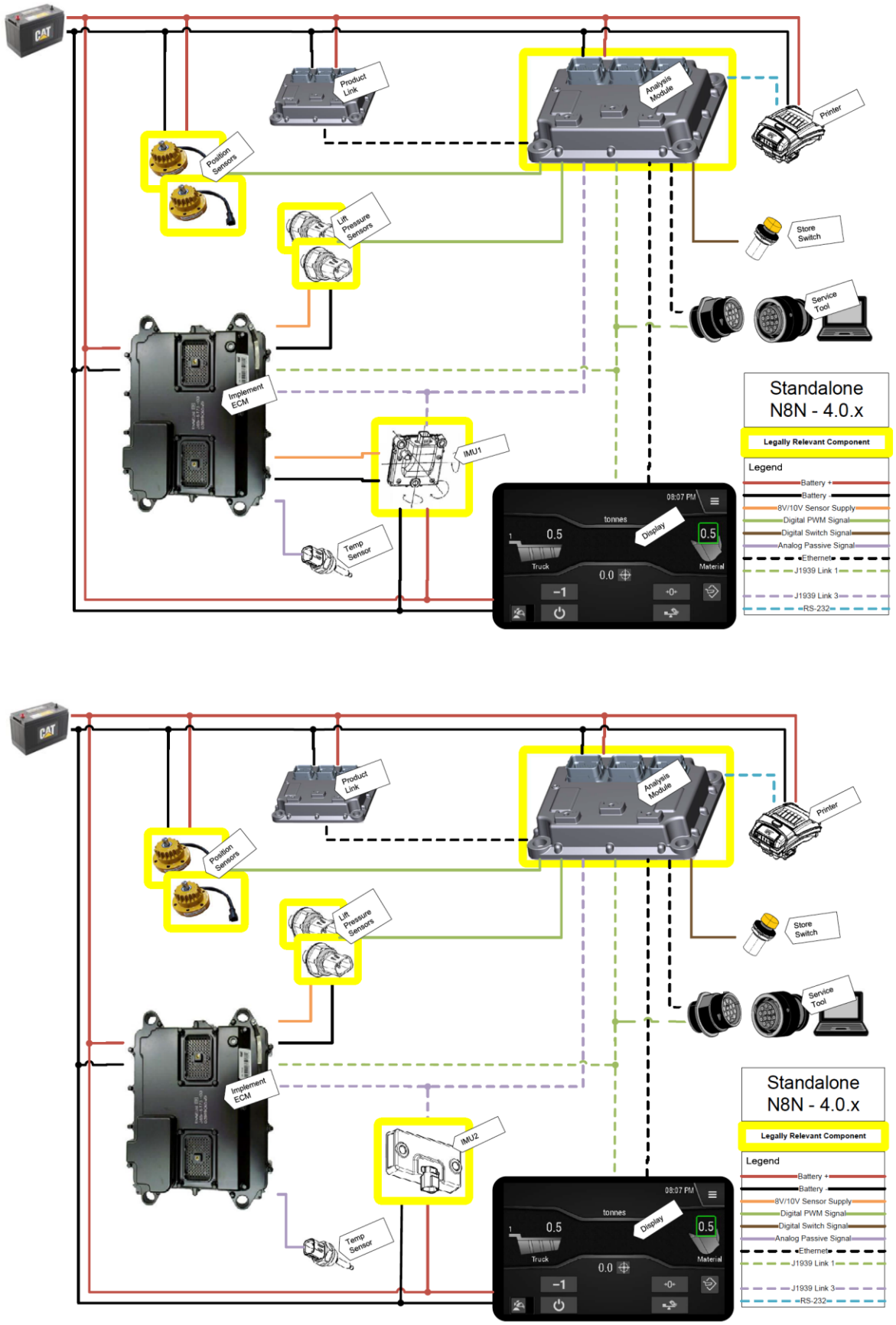


1. *Descriptive Markings Film*
2. *Analysis Module*
3. *Pressure Sensors (Lift Cylinder – Rod and Head End)*
4. *IMU (Inertial Measurement Sensor)*
5. *Rotary Position Sensors (Lift and Tilt Linkage Position Sensors)*

(a) Typical Caterpillar Model N8N Wheeled Loader Weighing Instruments

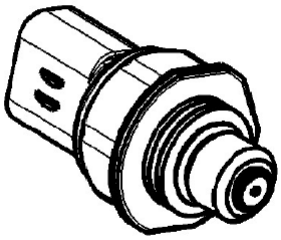


(b) Typical Caterpillar Model N8N Wheeled Loader Weighing Instrument Advanced System Overviews (Pattern)



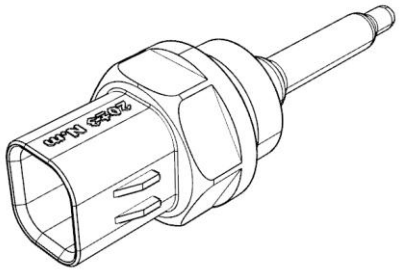
(c) Typical Caterpillar Model N8N Wheeled Loader Weighing Instrument Standalone System Overviews (Variant 2)

FIGURE 6/20A/15 – 2



Typical Caterpillar Pressure Sensors Installation

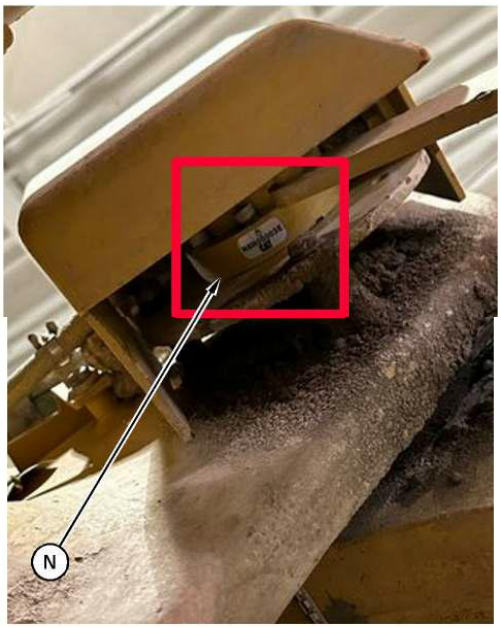
FIGURE 6/20A/15 – 3



Caterpillar Hydraulic Oil Temperature Sensor

FIGURE 6/20A/15 – 4

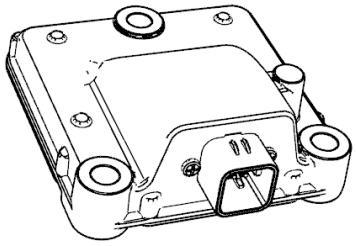
Caterpillar Rotary Position Sensor on Vehicle Frame



Caterpillar Rotary Position Sensor on Lift Arm

Caterpillar Rotary Position Sensors

FIGURE 6/20A/15 – 5

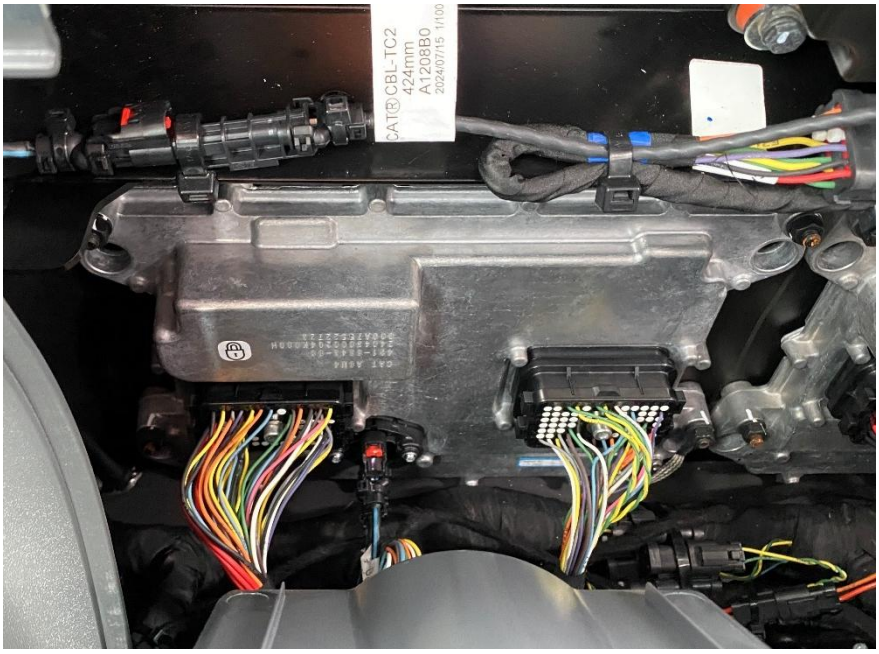


Caterpillar Inertial Measurement Sensors

FIGURE 6/20A/15 – 6

Caterpillar Analysis Module

FIGURE 6/20A/15 – 7



Caterpillar Implement ECM

FIGURE 6/20A/15 – 8

Caterpillar Model N8N Graphical Display Unit

FIGURE 6/20A/15 – 9

Caterpillar Model Production Measurement Onboard Printer

FIGURE 6/20A/15 – 10

Seal Event Counter and Seal Status

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