ART100 Advanced Blockage Monitor



We hope that you find this manual easy to use and helpful. Contact Agtron Enterprises Inc. at *1-800-667-0640*, on the web at **agtronservice.com** or email *customerservice@agtron.com* if you have any questions.

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Congratulations on your purchase of an ART 100 Advanced Blockage Monitor! With this state-of-the-art monitor you can detect blockages in up to 120 seed or 120 fertilizer runs.

How It Works

This symbol appears throughout this manual and indicates background and additional information in regards to the operation of the ART system.

ART 100 Advanced Blockage Monitors use infrared seed sensors to measure seed rate and check for blockages. The sensors operate on a similar principle to that of a motion detector in a security system. Sensors are connected in a loop, each communicating in turn, and each including build-in diagnostics. The system determines the number of sensors in a loop automatically. A maximum of 120 sensors can be connected in a loop.

2.0 Parts List

Standard Parts	Part Number
Monitor Head	AGRTH10
Y-cable	9ARTY10
Extension cable - 10 foot	9ARTM10
Extension cable - 20 foot	9ARTM20
Sensor Loop cable - 10 foot	9ARTX10
Sensor Loop cable - 20 foot	9ARTX20
Manual	MNART10

Sensors

1.0

Seed Rate sensor - 1 inch or 25 mm (inside diameter)------ AGSS25A Seed Rate sensor - 1¹/₄ inch or 32 mm (inside diameter)------ AGSS32A

3.0 Installation and Setup

3.1 Mounting

To mount the Monitor Head, remove the backing from the adhesive hook and latch strip; located on the back of the Monitor Head. Mount the Monitor Head in a location where the display can be easily seen, and all the buttons are accessible.

Note: The hook and latch strip allows the Monitor Head to be easily moved.



Monitor Head

Note: Do not mount in a location that obstructs the view of the road or work area.

The tools required to install the Monitor Head are:

 \blacktriangleright Wire strippers

 \triangleright Wire cutters

 \succ Crimp tool

Route the power cable to a switched 12 volt source in the accessory panel. Cut off any excess cable. Secure the power cable to the equipment with cable ties. Route the Extension cable from the Monitor Head towards the tractor hitch. Secure the Extension cable to the equipment with cable ties.



Monitor Head (female) Extension cable (male)

Cable Connections



Do NOT connect the black wire to the negative terminal of the tractor battery.

If the Power button is used to turn off the Monitor Head there is a small current draw; less than 0.002 Amps.

Power Cable

Connect the red power wire to a switched 12 volt source; the Monitor Head is off when the ignition is off. A fuse is not required.

Connect the *black* power cable wire to a ground source. Not all tractor cabs are properly grounded; it is recommended to use a ground source in the fuse panel.

When making Extension cable connections, make sure you align the molded arrows. If they are difficult to push together, check the condition of the pins.

To help avoid electrical interference problems, create a figure eight shape with excess cable before securing.

Seed Sensor Installation 3.2

- 1. Select a mounting location near the distributor. The Sensor Loop Cables should not be stretched tight when connected.
- 2. Mount the Seed Sensors in the hose above the implement chassis to protect the Seed Sensors and cables from field debris damage.
- 3. Secure the Seed Sensors in the hose using metal hose clamps.

If necessary, apply heat to the hose ends in order to fit the hose over the sensor.

Notes

Notes



To keep plugs clean, always connect unused seed sensor cables together.

3.3 Y-Cables and Sensor Loop Cables

Y-Cable Installation (less than 60 sensors)

- 1. Select a mounting location for the Y-cable in the center of the implement.
- 2. Secure the ring terminal of the Y-cable to the chassis of the implement.
- 3. Connect the Y-cable's male Sensor Loop Cable to Seed Sensor 1 (located on the far left side of the implement) using Sensor Loop Cables as needed.
- 4. Connect the Y-cable's female Sensor Loop Cable to the last Seed Sensor using Sensor Loop Cables as needed.

Y-Cable Installation (more than 60 sensors)

On systems with more than 60 Seed Sensors, an additional Y-Cable must be installed in the middle of the loop to improve power distribution.

- 1. Connect the blue male end of the second Y-cable to the blue female end of the first Y-cable.
- 2. Connect the first Y-cable's male Sensor Loop Cable to Seed Sensor 1 (located on the far left side of the implement) using Sensor Loop Cables as needed.
- 3. Connect the first Y-cable's female Sensor Loop Cable to the last Seed Sensor using Sensor Loop Cables as needed.
- 4. Connect the second Y-cable's male and female Sensor Loop Cable into the middle of the seed sensor loop.



When making connections, align the molded arrows, push together, and secure the latch. If the connectors difficult to push together, check the condition of the pins.

To prevent cable damage, have cables follow the hydraulic hoses whenever possible.

Sensor Loop Cables

- 1. Select a Seed Sensor on the first distributor or tower on the driver's left as Seed Sensor 1.
- 2. Connect the male plug of the first Seed sensor to the female plug of the next closest Seed Sensor. (This will be Seed Sensor 2).
- 3. Continue connecting the remaining Seed Sensors on each tower or distributor in this fashion.
- 4. Using 10-foot Sensor Loop Cables, connect the towers or distributors together.

If the cables of the seed sensors appear to swing or shake excessively, secure them by entwining the sensor loop cables with rope; tighten the rope only enough to stop the swinging motion.



Notes

8.2 Seed Densities

Seed	seeds/pound	seeds/kilogram	
Barley: 2 row	10,000	22,050	
Barley: 6 row	12,500	27,563	
Bean	1,800	3,969	
Buckwheat	15,000	33,075	
Canola: Campestris	189,000	416,745	
Canola: Napus	132,000	291,060	
Canola: Polish	190,000	418,950	
Corn	1,200	2,646	
Fababean	1,150	2,536	
Fall Rye	14,000	30,870	
Flax	76,000	167,580	
Lentil	10,300	22,712	
Mustard	245,000	540,225	
Oats	12,500	27,563	
Peas	2,550	5,623	
Rice	18,500	40,793	
Safflower	12,500	27,563	
Soybean	3,400	7,497	
Sunflower	3,100	6,836	
Triticale	10,150	22,381	
Wheat: Hard Red	13,300	29,327	
Wheat: CPS	11,400	25,137	
Wheat: Durum	10,500	23,153	
Wheat: Extra Strong	10,500	23,153	
Wheat: Soft White	13,400	29,547	

Fertilizer

Ammonium Nitrate	48,400	106,704
Ammonium Phosphate	29,600	65,257
Potash	18,300	40,345
Urea	37,800	83,335

4.0 Quick Start - Blockage Monitoring

To turn on, press the PWR key. To turn the system off, press and hold the PWR key for five seconds.

Set Sensitivity

The Sens value must be set for Block mode to function. Follow this procedure to change the Sens value.

- 1. Press the Sens button.
- 2. Use the **O** and **O** buttons to set the Sens value; see *Appendix A*.
- 3. Press any mode button to complete the change.

Follow one of these two procedures to set the Sens value for the Seed Rate sensors.

Method 1:

- 1. Manually check for any blockages.
- 2. Begin seeding.
- 3. Press the Block button.
- 4. Press the Sens button. If blockage alarms are not issued, use the **O** button to increase the sensitivity value by 10 until blockage alarms occur; repeating Step 2 to 4.
- 5. Use the Obutton to decrease the sensitivity value by three until blockage alarms are no longer issued.

Method 2:

- 1. Calculate the ground speed in feet or meters per second. Ex: *The ground* speed is 8 Km/h. $(8 \text{ Km/h } X \text{ 1000 } m) \div 3600 \text{ s} = 2.22 \text{ m/s}.$
- 2. Calculate the area coverage per second. The width of the implement is required. **Ex:** *The implement width is 12 m.* $(2.22 \text{ m/s } X \text{ } 12 \text{ } m) \div 10,000 \text{ } m^2 = 0.002664 \text{ hectares/s.}$
- 3. Using the average of the number of seeds per pound or kilogram from *Appendix B*, calculate the application rate. **Ex:** *Two row barley has an average of 22,046 seeds/Kg. 35 Kg/Ha X 22,046 seeds/Kg = 771,610* seeds/ Ha.
- 4. To calculate the application rate in seeds per second, multiply the area coverage calculated in Step 2 by the application rate calculated in Step 3. Ex: 0.002664 hectares/s X 771,610 seeds/Ha = 2056 seeds/s
- 5. To calculate the Sens value, divide the application rate calculated in Step 4 by twice the number of openers. Record the product name and sensitivity value in *Appendix A*. **Ex:** *The implement has 50 openers.* 2056 seeds/s \div 100 = 21 seed/s. The sensitivity value is 18.

The goal is to have the SENSITIVITY value as high as possible without giving constant alarms. If a seed sensor measures fewer seeds per second than the Blockage Sensitivity value indicates, a blockage alarm is occurs.

A Blockage Sensitivity value of 0 will disable the power and alarms to the seed sensor loop. The default value is 15.

Operation

The Monitor Head turns on automatically when power is first supplied.

When turned on, the Monitor Head sounds the audible alarm three times, turns on the display and button backlights, displays $\exists r t$, and then displays 100. When Seed Rate sensors are connected to the Y-cable, the Monitor Head counts each Seed Rate sensor then displays $\exists r d$; this indicates a complete loop of Seed Rate sensors was detected. Block mode is then selected; the light above the **Block** button turns on.

If a complete loop of Seed Rate sensors is not detected, an error message occurs. An error message displays $\exists \neg \neg$ followed by the Seed Rate sensor number that is not reporting to the Monitor Head; the audible alarm will sound. None of the buttons function, and the error message remains until a complete loop of Seed Rate sensors is established. For more information, see the *Troubleshooting* section. Arrows are molded on the Sensor Loop and Extension cables. The arrows on the Sensor Loop cables indicate the counting direction, and are used to identify the number of a Seed Rate sensor; the male Sensor Loop cable of the Y-cable connects to the first Seed Rate sensor. The arrows on the Extension cables point towards the Monitor Head; located in the cab of the tractor.

The Power button is used to turn the Monitor Head on and off. To turn off the ART100 Blockage monitor, press and hold the Power button for half a second. To turn the Monitor Head on, press the Power button.

The Sens button is used to adjust the sensitivity value. The \bigcirc and \bigcirc buttons are used to adjust the sensitivity value. The \bigcirc button is used to acknowledge audible alarms.

Block Mode

5.0

Block mode monitors the Seed Rate sensors for blockages. Block mode cycles through all the installed Seed Rate sensors in numerical order regardless of whether a Seed Rate sensor reports a blockage or not.

The Sensitivity value is product specific. Change the Sensitivity value when changing the applied product.

Reference

8.1 Sensitivity Values

8.0

Sens Seeds/s	S ENS	SEEDS/S	<u>Sens</u>	Seeds/s	S ENS	SEEDS/S
14	26	29	51	123	76	615
25	27	30	52	131	77	657
β6	28	32	53	139	78	702
47	29	34	54	148	79	750
58	30	36	55	158	80	801
69	31	38	56	168	81	856
710	32	40	57	179	82	914
811	33	42	58	191	83	976
912	34	44	59	204	84	1043
1013	35	47	60	218	85	1114
1114	36	50	61	232	86	
1215	37	53	62	247	87	1271
1316	38	56	63		88	
1417	39	59	64		89	1451
1518	40	63	65		90	
1619	41	67	66		91	
1720	42	71	67	341	92	1769
1821	43	75	68		93	
1922	44	80	69		94	2019
2023	45	85	70	415	95	2157
2124	46	90	71		96	
2225	47	96	72	473	97	2463
2326	48	102	73	505	98	
2427	49	109	74	539	99	
2528	50	116	75	576	100	
Product	Se	ensitivity	PRODU	ст	1	SENSITIVITY
		<u></u>				

Blocked runs are indicated but when checked and found to be clear.

- Verify the Sensitivity is not set too high.
- Check inside the distribution towers for any foreign material. This may cause blockages to move from sensor to sensor.
- If it is always the same sensor giving the blocked message, trade that sensor with one in another position. If the blocked message moves with the sensor, replace that sensor.

Monitor displays CLN ____.

- Take note of the indicated numbers. This message indicates that the eyes (optical detectors) in the Seed Sensor tube are dirty.
- Clean the indicated Seed Sensors with warm water and a bristle pipe brush.
- If the Seed Sensor still causes a CLN message, replace it.

When BLOCK mode is selected the display always shows 0.

• Verify the Sensitivity is not set to zero. If the sensitivity is set to zero, the Seed Rate sensors are disabled.

A blockage alarm is issued when a reported seed rate, in seeds per second, is below the Sens value. For more information, see the **Quick Start** section. When a Seed Rate sensor reports a blockage, the audible alarm sounds instantly for five seconds. The visual blockage alarm does not occur until the Seed Rate sensor scan arrives at the Seed Rate sensor number reporting the blockage. When the visual blockage alarm occurs, - - followed by the blocked Seed Rate sensor number is displayed three times. When a blockage alarm occurs, look for a complete or partial blockage at the opener and distributor of the identified Seed Rate sensor.

If the hose is entirely blocked or excessive buildup on the eyes is detected for an extended period of time (approx. 1 min.) the monitor will display, $\begin{bmatrix} 1 & n \end{bmatrix}$ followed by the Seed Rate sensor number is displayed three times; the audible alarm will sound. When a Seed Rate sensor clean, $\begin{bmatrix} 1 & n \end{bmatrix}$, alarm occurs look for a complete blockage at the opener of the identified Seed Rate sensor, or the sensor requires cleaning.

Pressing the **O** button disables the audible alarm for every Seed Rate sensor for 20 seconds. When every Seed Rate sensor reports a blockage, pressing the **O** button disables the audible alarm. No further audible alarms will occur until a Seed Rate sensor reports normal operation.

A sensitivity value of zero disables Block mode; no blockage alarms occur. For more information, see the **Quick Start** section.

Blockage alarms will not occur when the Sens key is selected.

Rate Mode

Rate mode displays an average seed rate for the entire machine; in thousands of seeds per minute. The seed rate displays a hundredths place up to 99.9; 99,900 seeds per minute. Above 9999, the seed rate is displayed in millions of seeds per minute; the decimal point flashes. If Rate mode detects a seed rate above 99.99 millions of seeds per minute, $\Box F L$ is displayed.

Blockage messages are not displayed in Rate mode. If a blockage occurs, the audible alarm will sound and the light above the Block button will flash. Select Block mode to identify the blocked Seed Rate sensor.

6.0 Hidden Modes of Operation

Monitor Head Software Mode

The Monitor Head Software Version identifies the software in the Monitor Head. To display the software version number, simultaneously press the **Block** and **O** buttons. Once selected, all the button lights turn on, and X.YY is continually displayed; where X represents the hardware version and YY represents the software version. Press any mode button to exit.

Seed Rate Sensor Software Mode

The Seed Rate Sensor Software Version identifies the hardware and software version of each Seed Rate sensor. Simultaneously press the **Block** and **O** buttons to display the hardware and software version number of the first Seed Rate sensor. Once selected, all the button lights turn on, and x.yy followed by 1 continually cycles on the display; where X represents the hardware version, yy represents the software version, and 1 represents the first Seed Rate sensor. Use the **O** and **O** buttons to scroll through each Seed Rate sensor. Press any mode button to exit.

7.0 Troubleshooting

For this section, ____ indicates a sensor number.

CIn message (clean)

When a Seed Rate sensor can't count the seeds properly, $\begin{bmatrix} 1 \\ n \end{bmatrix}$ followed by the Seed Rate sensor number is displayed three times; the audible alarm will sound. When a $\begin{bmatrix} 1 \\ n \end{bmatrix}$ alarm occurs, look for a complete blockage at the opener of the identified Seed Rate sensor or buildup on the indicated Seed Rate sensor eyes.

Err message (error)

If a complete loop of Seed Rate sensors is not reported to the Monitor Head, $\Xi \neg \neg$ followed by the Seed Rate sensor number not reporting to the Monitor Head is displayed; the audible alarm will sound. The $\Xi \neg \neg$ message remains until a complete loop of Seed Rate sensors is established. When an $\Xi \neg \neg$ message occurs, look for a disconnected Sensor Loop cable, Seed Rate sensor or Extension cable at the identified Seed Rate sensor location.

Situations and solutions

To effectively troubleshoot the ART100 Blockage Monitor, start with a known "good" or working system. There are five areas of possible failure; the Monitor Head, Seed Rate sensors, Y-cable, Extension cables, and Sensor Loop cables. Listed below are situations that could occur with the various parts of the ART100 Blockage monitor.

Error (ERR) Messages Monitor displays ERR 1.

- Check all the cables and connections. If the monitor head does not detect any sensors, this error will occur.
- Bypass Sensor 1 by connecting Sensor 2 to the sensor loop cable from the Y-cable. If the message is no longer displayed, replace Sensor 1.
- Connect a Seed Sensor directly to the Y-cable`s male Sensor Loop Cable. If SNR 2 ERR is displayed, replace the Sensor Loop extension cable between the Y-cable and Seed Sensor 1.
- Connect the Y-cable and a sensor directly to the monitor head. If SNR 2 ERR is displayed, replace the main extension cables. If SNR 1 ERR is displayed, either the monitor head or Y-cable is faulty contact Agtron Service.

Monitor displays ERR one higher than total number of sensors.

- Check all the cables and connections.
- Bypass the last sensor by connecting the second last sensor to the sensor loop cable to the Y-cable. If the message is no longer displayed, replace the last sensor.
- Connect a Seed Sensor directly to the Y-cable. If SNR 2 ERR is displayed, replace the Y-cable. If SNR 1 ERR is displayed, replace the Sensor Loop extension cable between the Y-cable and the last Seed Sensor.

Monitor Displays ERR____.

- Take note of the Sensor number indicated.
- Inspect the Sensor Loop cables in the indicated Seed Sensor location for damage. Replace or bypass any damaged pieces.
- Bypass the indicated Seed Sensor number. This is done by unplugging the Seed Sensor and plugging the cables of the seed Sensor before and after together. The Seed Sensor count will be one less.
- If this results in normal operation, replace the bypassed sensor.
- If the ERR message is still displayed, bypass the Seed Sensor before the indicated Seed sensor number. If this results in normal operation, replace the Seed Sensor.
- If a Sensor Loop cable connects the two Seed Sensors, swap the Sensor Loop cable. If normal operation begins, replace the Sensor Loop cable.

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