AgriLIFE EXTENSION
Texas A&M System

TRACTOR STANDARDS THAT PROMOTE SAFETY

David W. Smith, Extension Safety Program

Can you imagine a world with no manufacturing standards for the control and operation of automobiles? What if the accelerator in one model was controlled by the left foot, while in another model the accelerator was controlled by the right foot? What if every manufacturer had their own color coding and symbols for turn signals or for shifting gears? Not only would drivers need to read the user manual for each vehicle, but every driver and passenger would be subject to a higher degree risk while on the road. Standard vehicle controls make it easier for us to drive, making everyone on the road safer. This also holds true in tractor operation.

Farm tractors have evolved from a relatively simple, stationary engine that provided power to pulleys and shafts, to a highly-mobile, highly-sophisticated power and transport machine capable of pushing, pulling, and lifting attached implements, providing power through mechanical and hydraulic energy to perform almost all farm tasks. If you have ever tried to operate an old tractor with missing decals, no color coding, and unfamiliar control levers, you can appreciate the tractor industry's efforts in developing standards for uniform and safe tractor operation. This fact sheet will discuss the current standards for color coding, operation of controls, and graphic symbols for tractor operation.

COLOR CODING

Responding to the need for a standardization of tractor controls, the Farm and Industrial Equipment Institute proposed using color codes to represent common functions of tractor operation. In February 1984, the Power and Machinery Division Standards Committee of the American Society of Agricultural Engineers (ASAE) approved and adopted the color code system.

ASAE EP443.1 FEB 04 – Color Coding Hand Controls defines a voluntary system of color coding hand controls which will aid in identification by operators. Hand controls include, but are not limited to, levers, switches, knobs, handles, and buttons, which the tractor operator manipulates to activate or control machinery functions. Following is a summary of this standard.

RED – Indicate single-function engine stop controls. Where key switches, ignition switches or hand throttles are used to stop the engines, the "off" or "stop" positions will be indicated with red lettering and/or symbols.

ORANGE – Designates machine ground motion controls, such as engine speed controls, transmission controls, parking brakes or park-locks, and independent emergency brakes.

Where the engine speed and engine stop controls are one, the controls may be red.

Steering wheels or other steering controls may be black or any other color than red or yellow.

YELLOW – Indicates function controls which involve the engagement of mechanisms such as power take-offs (PTOs).

Yellow is also used to designate controls on other farm machinery that operate separators, cutterheads, feed rolls, picking units, elevators, spray pumps, winches, and unloading augers.

BLACK – or some other dark color is used to designate controls for 1) positioning and adjusting attachments such as front-end loader buckets, 2) controlling unloading components such as bin dumps, ejector gates, and elevator lifts, 3) setting and adjusting chokes, seats, and steering mechanisms, and 4) adjusting headlights, flashers, turn signals, air conditioning, heating, and windshield wipers.

LOCATION AND OPERATION OF HAND CONTROLS

Standardization of the location and operation of hand controls has improved tractor safety and efficiency. Although there are exceptions, most tractor manufacturers follow ASAE Standard S335 to design foot controls, hand controls, and combination foot and hand controls. This allows tractor operators to switch from one tractor to another without having to search for certain controls. Since you often do multiple tasks at one time while on a tractor, knowing where the controls are and how they operate can help you avoid unnecessary accidents.

ASAE S335 – Operator Controls on Agricultural Equipment, adopted in 1969 and revised in 1989, was intended to improve operator efficiency and convenience. It provides uniform guidelines for the location and operation of controls on agricultural and farmstead equipment in the immediate vicinity of the operator's normal position (the seat on farm tractors). This standard relates to the position and operation of:

- Brake control
- Clutch and PTO control
- Engine speed control
- Ground speed and directional control
- Differential lock
- Steering control
- Electrical controls
- Engine stop controls
- Lift controls for implements or equipment
- Front-end loader arm and bucket controls

Following is a summary of these voluntary standards.

A. BRAKE CONTROL

The brake pedal(s) are engaged by pressing the pedal(s) downward or forward with the operator's right foot. Hand-operated parking brakes are engaged by pulling the control upward or rearward.

B. CLUTCH CONTROL

The clutch operated by a foot pedal shall be disengaged by pressing the pedal downward or forward with the operator's left foot. Hand-operated clutch pedals are disengaged by moving the control rearward or toward the operator.

A hand-operated power take-off (PTO) clutch is disengaged by moving the control rearward or downward. Conversely, the hand-operated PTO clutch is engaged by moving the control forward or by pulling upward.

C. ENGINE SPEED CONTROL

Hand-operated engine speed controls are operated with the right hand. When the speed control moves parallel with the tractor's longitudinal axis, engine speed is increased by moving the control forward or upward.

When the hand control moves parallel to the rim of the steering wheel, engine speed is increased by moving the control rearward or downward.

When engine speed is controlled with the foot, speed is increased by pressing the pedal downward or forward with the right foot.

D. GROUND SPEED AND DIRECTIONAL CONTROL

When a hand-operated, forward-reverse directional control lever (non-variable speed) is used, move the lever forward for forward machine motion and backward for backward machine motion.

When a hand-operated, variable speed control is used, move the control forward to increase speed.

Foot-operated combination directional and variable-speed controls are operated by the right foot. Press the foot pedal forward or downward with the toe to move forward. Press the foot pedal rearward or downward with the heel to move backward.

E. DIFFERENTIAL LOCK

Engage a differential lock control by moving the control forward or downward.

F. STEERING CONTROL

When a steering wheel is used, rotate the wheel clockwise to turn right. Rotate the wheel counterclockwise to turn left.

When a single lever is used for steering, move the lever right to turn right, and move the lever left to turn left.

G. ELECTRICAL CONTROLS

For rocker switches mounted horizontally, push on the forward or right portion to turn on, start operation, move forward, increase speed, or cause movement downward.

For rocker switches mounted vertically, push on the upper portion to turn on, start operation, move forward, increase speed, or cause movement upward.

H. ENGINE STOP CONTROL

When a key switch control is used, turn the key counterclockwise to stop engine.

When a mechanical push-pull control is used, the control must be located within 6 inches of the key switch. Pull the control to stop. The control should be red in color and include labeling which reads "pull to stop engine" and equipped with a fuel stop symbol.

I. LIFT CONTROLS FOR IMPLEMENTS OR EQUIPMENT

Lift controls in the immediate vicinity of the operator's station (seat) should be located on the right-hand side of the operator. When hand-control levers are used, move the lever forward or downward away from the operator to lower the implement or equipment. To raise the implement or equipment, move the lever rearward, upward, or toward the operator.

When a heel and toe foot control is used, press the forward part of the pedal downward to lower the implement or equipment, and upward to raise the implement or equipment.

J. FRONT-END LOADER ARM AND BUCKET CONTROLS

Controls must be located on the right-hand side of the operator.
When two control levers are used, the lift arm control is located closest to the operator. The bucket control is located to the right of the lift arm control. To lower the lift arm, move the lift arm control forward, downward, or away from the operator. To raise the lift arm, move the lift arm control in the opposite direction. To dump the buck, move the bucket control forward, downward, or away from the operator. To roll back the bucket, move the bucket control in the opposite direction.

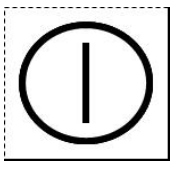
When a single lever is used to control both the lift arm and bucket, move the lever forward to lower the arm, move the lever backward to raise the lift arm, mover the lever right to dump the bucket, and move the lever left to roll back the bucket.

GRAPHICAL SYMBOLS FOR OPERATOR CONTROLS AND DISPLAYS

We use graphic symbols every day during our normal routine. Have you ever taken the time to examine your computer or your computer keyboard? Computer manufacturers use a set of standard symbols that have consistent meanings to eliminate confusion in operating a computer.

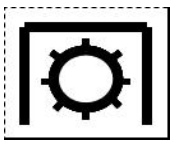
Use of standard symbols also promotes tractor safety. In June 1967, the ASAE adopted a set of graphic symbols for use in operating agricultural equipment. *ASAE S304.7 JUN00 – Graphical Symbols for Operation Controls and Displays on Agricultural Equipment* is the standard is used by nearly all tractor manufacturers. As tractor technology continues to evolve, new symbols will be developed as needed.

Following is a sample of the common tractor-related symbols and their meanings.

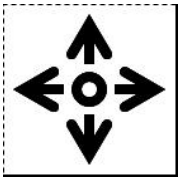


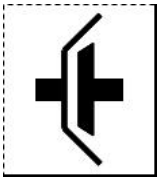
On and

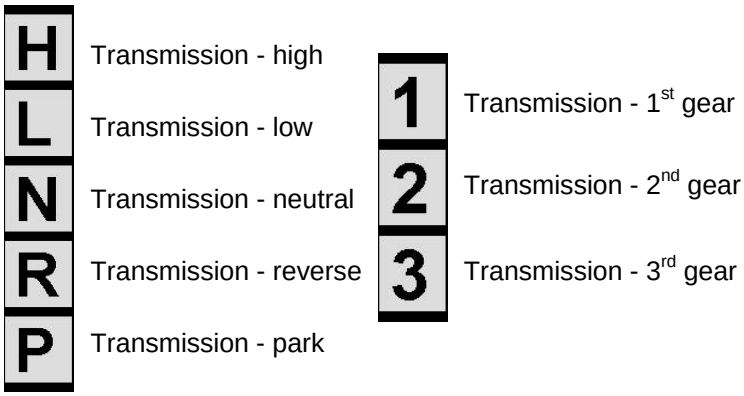
Fast



Power take-off







As this fact sheet demonstrates, communicating instructions includes more than the written word. Color coding, consistent operation of controls, and graphic symbols serve to reinforce correct and safe operation of complex machinery. The next time you operate a tractor, take time to recognize some of these standard features that you may have only reacted to subconsciously.

REFERENCES

1. ASAE EP443.1 FEB04. *Color Coding Hand Controls.* www.asae.org

2. ASAE S335.4 FEB04. *Operator Controls on Agricultural Equipment.* www.asae.org

3. ANSI/ASAE S304.7 JUN00. *Graphical Symbols for Operator Controls and Displays on Agricultural Equipment.* www.asae.org