

**ENGINE / CLUTCH REMOVAL & RE-ASSEMBLY: BCS HEAVY-DUTY CONE CLUTCH TYPE ON ENGINES WITH 3/4" OR 1" CRANKSHAFT (see separate document for taper-crankshafts)**

**TO START WITH:** it is best to have an implement on the tractor (to stabilize it once the engine is removed), and the handlebars in the Rear-PTO (soilworking) position, so they are out of the way.

**HOW TO FIGURE OUT IF YOUR ENGINE HAS A 3/4" OR 1" CRANKSHAFT:** IF YOUR BCS MACHINE HAS AN **ADAPTER PLATE** BETWEEN THE ENGINE AND TRANSMISSION, THE ENGINE HAS A 3/4" OR 1" SHAFT.



**#1.** IF machine is electric start, remove battery cables (NEGATIVE FIRST! The Tech in this pic is showing what NOT to do!!) and battery (diesel engine pictured)



**#2.** remove 13mm nuts holding engine & adapter flange to transmission (diesel engine shown) — a 3/8" drive ratchet with extension and 13mm universal-joint socket is preferred, and may keep you from having to remove battery box (if equipped)



**#2.5.** ....A 13mm wrench can be used instead, but you may have to remove the battery box / shroud support (if your machine has one) to get to top bolt. (gas engine pictured)



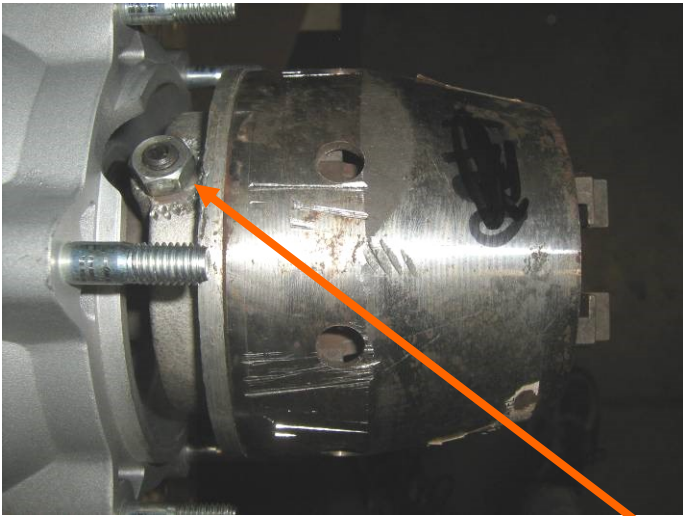
**#3.** (gas engine pictured) If you have a cement block, milk crate, pallet or something like this to rest the engine on, you can remove engine without disconnecting throttle / kill switch linkage....(GO TO FIGURE 3.5)



**#3.5.** ....and turn engine to the side, to keep from "stretching" the linkage cables. (gas engine pictured; diesel engine turns to opposite side)

**#4.** However, if it is easier, or if you are afraid of damaging the cables, feel free to disconnect them at the engine. Always disconnect them with the throttle at idle position and the kill lever "up" On diesel engines, make sure to mark which cable is which!!

**There are TWO types of fastening systems holding the clutch to the engines with 3/4" or 1" crankshafts. The next 4 pictures show the OLDER style (used before mid-2007 production), and the pictures after that show the NEW style. Select whichever pictures pertain to your machine.**



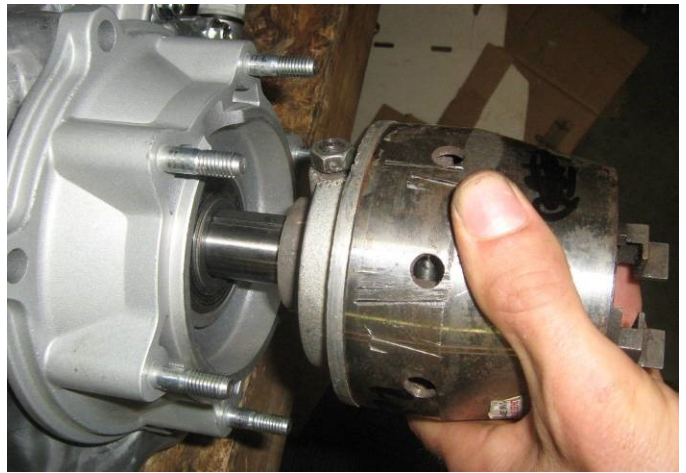
**#5A. OLD STYLE MOUNTING: ROTATE CLUTCH TO LINE UP JAM-NUT & SET-SCREW WITH CUTOUT IN ENGINE MOUNTING FLANGE**



**#6A. LOOSEN JAM-NUT WITH 13MM SOCKET**



**#7A. LOOSEN ALLEN-HEAD SET SCREW WITH 4MM ALLEN WRENCH**



**#8A. REMOVE CLUTCH FROM ENGINE SHAFT. NOTE: INSPECT THRUST WASHER AND BEARING ON ENGINE SIDE OF CLUTCH FOR DAMAGE/WEAR**



**#5B. NEW STYLE MOUNTING: DETERMINE WHICH ALLEN WRENCH NEEDED (3/16", 7/32" OR 1/4", DEPENDING ON CLUTCH MODEL) TO LOOSEN CLUTCH HOLDING BOLT (NOTE: DO NOT USE AN ALLEN WRENCH WITH A "BALL END" AT THE TIP!!**



**#6B. USING CHANNEL-LOCK PLIERS, STRAP-WRENCH, PIPE WRENCH, ETC. TO KEEP CLUTCH FROM TURNING, PUT A LEVERAGE PIPE (OR A VISE-GRIP) ON ALLEN WRENCH AND LOOSEN BOLT. BOLT IS STANDARD RH THREAD. (THIS PICTURE ACTUALLY SHOWS TIGHTENING BOLT...BUT YOU GET THE IDEA)**



ONCE CLUTCH IS REMOVED, IF CLUTCH IS REPAIRABLE, BOX UP CLUTCH WITH ADEQUATE PACKING MATERIAL (TO KEEP IT FROM GETTING DAMAGED IN SHIPMENT), AND SEND TO EARTH TOOLS FOR REBUILDING. **IT IS NOT RECOMMENDED TO DISASSEMBLE THE CLUTCH WITHOUT PROPER EQUIPMENT, OR SERIOUS INJURY MAY OCCUR FROM THE HIGHLY CHARGED SPRING INSIDE IT.**

THESE CLUTCHES FIT VERY WELL, WITH ADEQUATE PADDING, IN A "PRIORITY MAIL MEDIUM (8.5x11x5.5") FLAT RATE BOX", WHICH WILL GET HERE FOR ABOUT \$12 IN 2-4 DAYS FROM ANYWHERE IN THE CONTINENTAL USA. OR, YOU CAN SHIP BY UPS OR FEDEX IF YOU PREFER.

Our shipping address: Earth Tools Inc.  
1525 Kays Branch Rd., Owenton KY 40359

OUR TURNAROUND TIME FOR CLUTCH REPAIRS IS USUALLY 1 TO 4 DAYS (PLUS SHIPPING TIME) Depending on our backlog.

#7B. THE NEWER TYPE CLUTCH IS TIGHTENED ONTO A TAPERED BUSHING ON THE ENGINE CRANKSHAFT. TO REMOVE: BACK OUT THE ALLEN-SCREW INSIDE CLUTCH UNTIL IT STOPS, THEN, HIT THE SIDE OF THE CLUTCH WITH A HAMMER (WITH A SOFT FACE PREFERABLY) TO LOOSEN THE TAPER-LOCK. ONCE LOOSE, THE CLUTCH WILL NOW HAVE SOME MOVEMENT ON CRANKSHAFT. THEN FINISH BACKING OUT THE SCREW AND REMOVE THE CLUTCH. (TAPERED BUSHING DOES NOT NEED TO BE REMOVED FROM CRANKSHAFT, UNLESS IT IS DAMAGED.)

## RE-ASSEMBLY

RE-INSTALL CLUTCH TO ENGINE CRANKSHAFT AND ENGINE BACK TO TRACTOR IN THE REVERSE ORDER THEY WERE REMOVED.

### IMPORTANT NOTE:

WHEN RE-INSTALLING ENGINE ONTO TRACTOR, MAKE SURE THROWOUT BEARING SHIELD IS ARRANGED AS PICTURED: WITH TABS AT BOTTOM!! THESE TABS SLIDE UNDER CLUTCH FORK IN TRANSMISSION TO KEEP SHIELD FROM TURNING.

WHEN SLIDING ENGINE BACK ONTO TRANSMISSION, IT MAY TAKE A FEW TRIES TO GET THE GROOVES ON THE SHAFT (THE "SPLINES") LINED UP PROPERLY WITH THE SPLINES IN THE CLUTCH...IT IS A GOOD IDEA TO "SIGHT" THIS IN ADVANCE. ALSO, BE CAREFUL NOT TO BUMP THE THROWOUT BEARING SHEILD (MENTIONED ABOVE) OUT OF PROPER ALIGNMENT WHILE PUTTING THE ENGINE ON. THIS MAY TAKE A FEW TRIES TO GET IT RIGHT, BUT IT'S REALLY NOT THAT HARD.



AFTER INSTALLING A CLUTCH, THE CLUTCH CABLE MAY NEED TO BE RE-ADJUSTED. PROPER ADJUSTMENT IS: SET CABLE WITH MINIMUM AMOUNT OF TENSION NECESSARY SO THAT WHEN CLUTCH HANDLE IS FULLY SQUEEZED, TRACTOR COMES TO A FULL STOP. ESSENTIALLY, YOU WANT THE MOST CABLE "FREE PLAY" YOU CAN GET WITH THE CLUTCH HANDLE IN THE "RELAXED" POSITION, WHILE STILL HAVING THE CLUTCH DISENGAGE POWER WHEN CLUTCH HANDLE FULLY SQUEEZED. ADJUST CABLE TENSION **USING HOLLOW BOLT / JAMNUT NEAR CLUTCH HANDLE** (BACKING OUT [so more threads are exposed on the bolt] INCREASES TENSION, SCREWING IN INCREASES FREE PLAY)... **DON'T FOOL WITH CABLE CLAMP DOWN BY CLUTCH FORK / ENGINE UNLESS YOU RUN OUT OF ADJUSTMENT AT THE "TOP END".** You can view our *Clutch Adjustment VIDEO* by copying this URL into your browser: <http://www.youtube.com/watch?v=SAv8eE7ytiY&list=UUnEPLYReFF1UIPuQmJlqGow&index=1&feature=plcp>

**QUESTIONS? EARTH TOOLS: 502-484-3988**