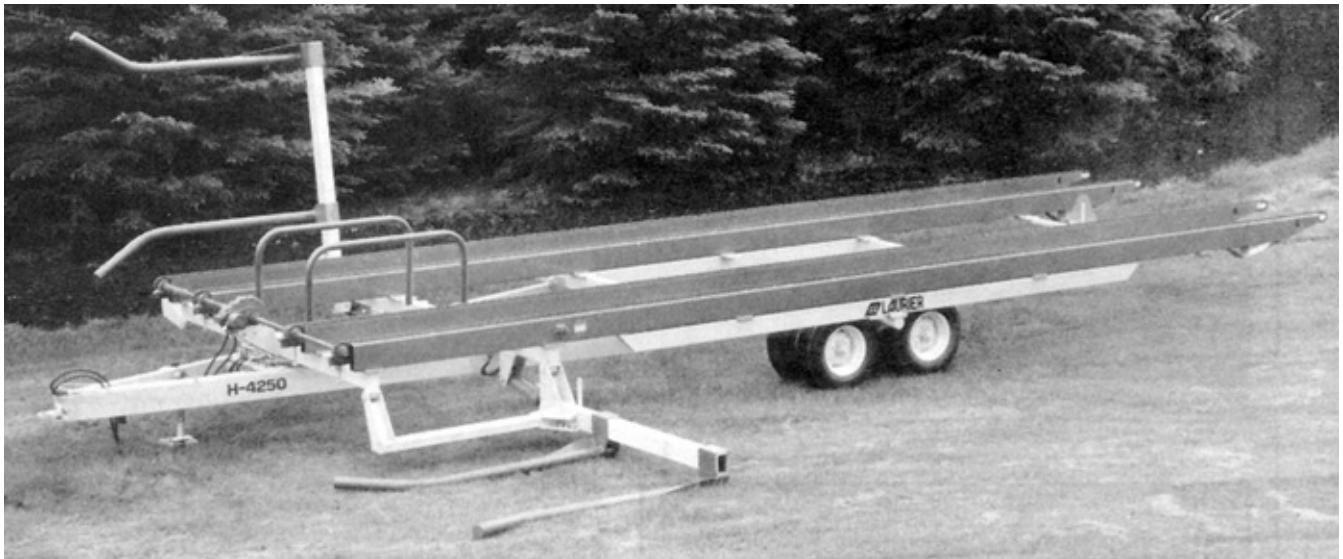


Evaluation Report

522



Laurier H-4250 Round Bale Mover

A Co-operative Program Between



ALBERTA
FARM
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PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

LAURIER H-4250 ROUND BALE MOVER

MANUFACTURER AND DISTRIBUTOR:

Laurier Manufacturing Ltd
Box 85
Laurier, Manitoba
R0J 1A0

RETAIL PRICE: \$14,200.00 (March 1986, fob factory)

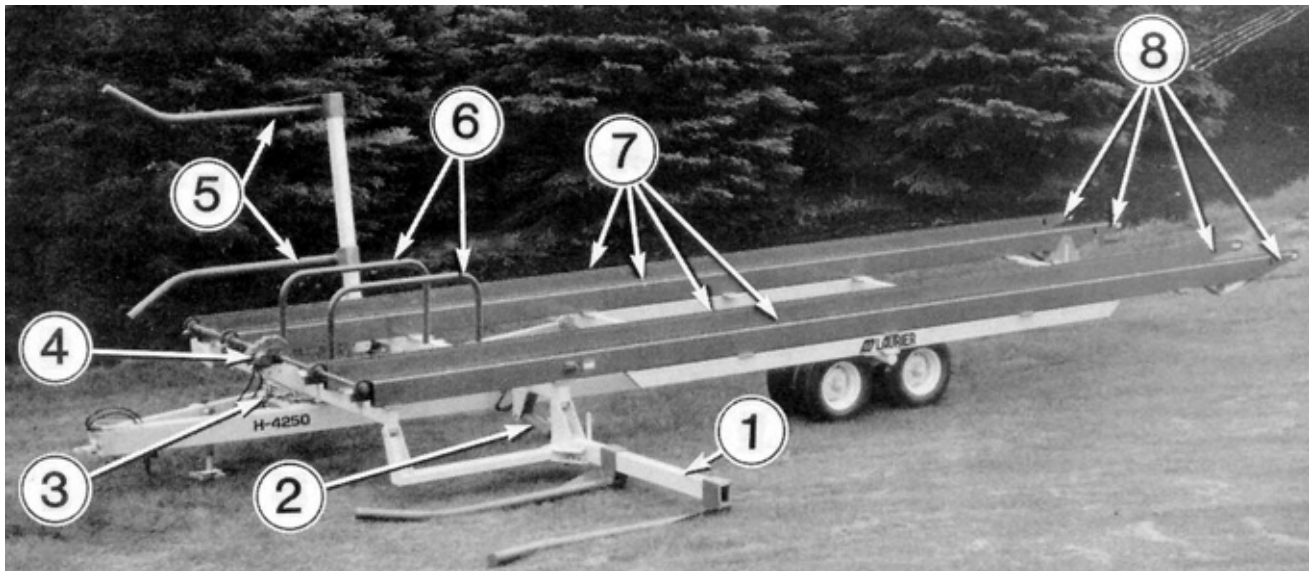


FIGURE 1. Laurier H-4250 Round Bale Mover: (1) Lift Arm, (2) Lift Cylinder, (3) Selector Valves, (4) Orbit Motor, (5) Bale Forks, (6) Bale Dividers, (7) Conveyor Chains, (8) Bale Beds.

SUMMARY

Ease of Operation: The Laurier H-4250 was very easy to operate. Operators required about 2-3 hours of operational time to become familiar with the controls and necessary procedures in order to load/unload bales in an orderly manner. Bale forks had to be adjusted to be compatible with different sizes of bales. Two set screws on each bale fork were loosened and the bale fork moved along the lift arm until the desired position was reached. Conveyor chain tensions were individually adjustable from the rear of the bale mover.

Capacity: The Laurier H-4250 bale mover has a load capacity of 18,000 lbs (8165 kg). The two 33 ft (10.1 m) bale beds allowed room for six, 6 ft (1.8 m) bales or seven 5 ft (1.5 m) bales on each bed.

Quality of Work: The Laurier H-4250 bale mover's performance was rated very good in all conditions. The Laurier was effective in retrieving and moving round bales of all sizes. Operator experience was needed before bales could be loaded or unloaded in a continuous, uniform and orderly manner.

Crop losses and bale damage were very slight if well formed bales were handled. Some twine damage occurred when older ovate bales were handled. Additionally, when bales were loaded from the rear, by raising the deck and backing into the bales, heavy twine damage resulted.

Rate of Work: Rate of work was dependent on operator experience and the distance the bales were from each other. On the average, it took about 15 minutes to load twelve well

formed bales. The Laurier towed very well at speeds up to 20 mph (32 km/h). Unloading took about 2.5 - 3 minutes.

Power Requirements: At a speed of 6.1 mph (9.7 km/h), the fully loaded Laurier required 14.3 hp (10.7 kW) to keep it rolling on a firm alfalfa field. A tractor of at least 100 hp (75 kW) was required on soft, uneven summerfallow. The tractor also required one remote hydraulic circuit and an electrical system.

Operator Safety: The Laurier H-4250 was safe to operate as long as usual safety precautions were followed and a tractor of sufficient size and weight was used.

Operator's Manual: The operator's manual was well organized and contained useful information on assembly, warranty, operation, servicing and parts.

Mechanical History: Hitch mounting lugs failed at about 300 hours. A conveyor chain link failed at 310 hours.

RECOMMENDATIONS:

It is recommended that the manufacturer consider

1. Modification to the hitch mounting lugs on the main frame that would prevent separating due to failed material
2. Upgrading the minimum recommended hp (kW) of drawing tractor from 75 hp (57 kW) to 100 hp (75 kW)

Station Manager -- G.M. Omichinski

Project Technologist -- R K Harris

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. The reinforced lug weldment has been implemented in the 1987 production.
2. The hp (kW) requirement in the manual will also be revised from recommended 75 hp (57 kW) to 100 hp (75 kW).

MANUFACTURER'S ADDITIONAL COMMENTS:

An added feature on the 1987 production are lift arms floating with uneven terrain thus eliminating stress on the machine.

GENERAL DESCRIPTION

The Laurier H-4250 Bale Mover is a self-loading, tilting twin bed, eight wheel trailer, with four axles. Suspension is arranged four wheels per side, in a walking beam design. It is designed to retrieve, transport, and place round bales. The manufacturer recommends a tractor of at least 75 hp (57 kW) with a single hydraulic circuit and an electrical power source. Bales are picked up on either the left or the right side by hydraulically operated lift arms and placed on the bale beds. A hydraulic orbit motor driving twin chains per bed move the bales to the rear, so that more bales can be loaded. The twin beds consist of two chain rails spaced at 30 in (762 mm).

Each bed holds 6 or 7 bales depending on the size of bales. For unloading, the beds are tilted and the unloading chains are moved in reverse. The chains carry the bales off the beds. Bales can be reloaded by tilting bed and reversing chains. Detailed specifications are presented in APPENDIX I.

SCOPE OF TEST

The Laurier H-4250 was operated in typical prairie fields (TABLE 1) for 320 hours, while moving approximately 5000 bales.

It was evaluated for ease of operation and adjustment, quality of work, rate of work, power requirements, operator safety, and suitability of the operator's manual.

TABLE 1. Operating Conditions

Crop	Hours	Field Conditions
Native Grass	115	Rough pasture land with ditches and stones
Alfalfa	72	Moderately smooth
Brome & Timothy	90	Soft
Straw	43	Soft and smooth
Total:	320	

RESULTS AND DISCUSSION

EASE OF OPERATION AND ADJUSTMENT

Hitching: The Laurier H-4250 was equipped with an adjustable tongue hitch and an implement jack to raise the hitch to the proper height. A properly sized hitch pin with a suitable locking device made the hookup reliable and safe.

Two hydraulic hoses had to be attached to the tractor. The Laurier H-4250 was equipped with electrically controlled solenoid valves that control the flow of oil from the tractor to the various cylinders and orbit motor. An electrical selector switch for the solenoid valves had to be installed in the tractor cab within the operator's reach.

Loading: The Laurier H-4250 was placed in field position by removing the lift arm locking pins. The tractor lever that controls the bale mover's hydraulic circuit was pulled to the rear and held in place with a rubber strap. All operations were controlled by selecting the desired function on the electrical selector switch box. The switch controlling either the left or the right lift arm was selected depending upon which side of the Laurier was to be loaded first. The bale was approached with its axis being parallel to the direction of travel. As the bale was approached, the bale forks were lowered so that they just cleared the ground. Being certain that the bale was centred in the forks, the forks were raised when the bale touched the fork back brace. The bale rolled from the forks onto the bed. When very large bales were being handled, the fork was

lowered to about a 45° angle so that it would not interfere with the bale when it was moved rearward. The switch that controlled the lift arm of the opposite side was selected and another bale was loaded in the same manner. Once a bale was positioned on each bed, the chains were activated, moving the bale rearward just enough to leave room for two more bales to be loaded. This procedure was repeated until the loading was completed.

Operator experience was required before bales could be loaded non-stop and to prevent gaps in the load. Bales that were not lined up with their axis parallel to the direction of travel were sometimes knocked askew and tumbled onto their ends.

The Laurier H-4250 bale mover was equipped with additional holes to change the width of the beds to be compatible with varying sizes of bales. In addition, the bale divider bars at the front of the loader could be repositioned or removed to suit the situation and the size of the bales.

The Laurier H-4250 could also be loaded from the rear. In order to do this the deck was tilted and the conveyor chains activated to forward rotation. The machine was then backed into the bales, and the conveyor chain dragged the bales onto the bale beds. When loading in this manner two bales had to be loaded at the same time or uneven loads resulted. Loading bales from the rear caused damage to the twine holding the bales together.

Conveyor chain tension frequently required adjustment. This adjustment was easily accomplished by tightening the adjusting nuts provided at the rear of the machine (FIGURE 2).

Sometimes, if the lift forks were not adjusted to lift the bale clear of the chain rails, the bale would push the chain off its track (FIGURE 3). Proper adjustment of the chain tensions and lift fork position prevented this.

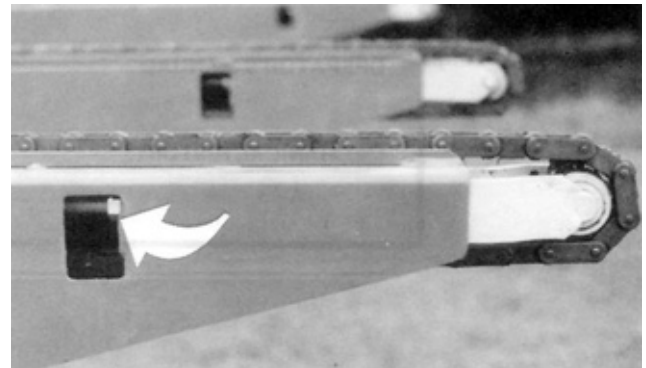


FIGURE 2. Chain Adjusters.



FIGURE 3. Chain Pushed Off Track by Bale.

Capacity: The Laurier H-4250 bale mover has a load capacity of 18,000 lbs (8165 kg). The two 33 ft (10.1 m) bale beds allowed room for six, 6 ft (1.8 m) bales or seven, 5 ft (1.5 m) bales on each bed. When loaded with seven bales per bed, the load was stable and allowed for transport over fairly rough ground, without the rear bales falling off.

The lift arms were capable of lifting 2630 lb (1193 kg) and 2480 lb (1125 kg) for the left and right side respectively, before the wheels on the opposing side would lift free of the ground.

Transporting: When transporting full or partially loaded, the lift arms should be raised as high as possible, to reduce the overall width of the machine, and to allow attachment of the safety pins (FIGURE 4). Extreme care had to be taken when transporting on busy roads and highways, as rear visibility was limited. The Laurier towed very well at speeds up to 20 mph (32 km/h). However to maintain a stopping distance of 50 ft (15.2 m) PAMI recommends not exceeding a transport speed of 8 mph (12.9 km/h) when towing a fully loaded H-4250 with the manufacturer's recommended tractor size of 75 hp (57 kW).



FIGURE 4. Lift Arm Safety Lock Pin.

Unloading: Before unloading, the lift arm safety pins were removed, and the lift arms were lowered slightly so they would not interfere with the two front bales as they moved rearward. The switch that controlled the deck tilt cylinder was energized and the deck was tilted slightly to allow some visibility to the rear for backing to the stack. It is recommended that the operator check the unloading area for obstructions as visibility was limited.

The Laurier was unloaded by backing up and stopping about 2 ft (610 mm) away from the previously unloaded bales. The deck was then raised to its full height and the conveyor chains activated in the reverse direction. As the bales were moved off the bale mover, they butted against the previous load and started to push the Laurier and tractor ahead. It was necessary to engage the tractor in a slow forward speed to aid the conveyor chains and to prevent twine and bale damage. When all bales are unloaded, the chains were stopped and the tilt deck was lowered to the "Load/Transport" position.

QUALITY OF WORK

The Laurier rotated bales during loading, placing them on the beds in different orientation from which they sat on the ground. During loading the bales rolled from the lift forks onto the beds, resulting in the previously weathered side placed down and the ground flattened spot placed up. In this position, bales would have less ability to shed moisture, tending to have increased spoilage. The Laurier H-4250 was effective in unloading bales in neat, straight windrows. Distance between bale circumferences depended on the size of bales being handled and the width of the bale beds.

Very little twine damage was encountered when unloading due to the non-aggressive action of the uncleated roller chains. Both the quality of work and the rate of work were very dependent upon operator experience. Losses during loading, transporting and unloading were considered insignificant.

RATE OF WORK

TABLE 2 gives the average time required to load, transport and unload 12 firm and well formed bales.

This table gives the average time, based on 10 trips or 120 bales. The field surface was fairly smooth, allowing a ground speed of about 14 mph (22.5 km/h). The operator had about 12 hours of experience on this machine.

TABLE 2. Average Time Required to Load, Travel and Unload

Load 12 bales	14.0 min
Travel 1/2 mi (0.8 km) & Backup to Stack	9.0 min
Unload	2.5 min
TOTAL	25.5 min

POWER & HYDRAULIC REQUIREMENTS

The Laurier H-4250 required a tractor of at least 100 hp (75 kW) equipped with a single remote hydraulic circuit and a 12 volt power supply. Although smaller tractors had sufficient power to pull the fully loaded bale mover on hard ground, they did not have enough power and weight to maintain positive control in soft fields of summer fallow. In addition, when attempting an emergency stop on the highway, tractors with power ratings lower than 100 hp (75 kW), could not maintain positive control. At a speed of 6.1 mph (9.7 km/h) the fully loaded Laurier required 14.3 hp (10.7 kW) to keep it rolling on a firm alfalfa field.

The Laurier H-4250 required one remote hydraulic circuit capable of 2000 psi and a flow rate of 15-20 gpm (0.95 L/s - 1.3 L/s). Hookup consists of connecting one pressure hose and one return hose into the remote hydraulic outlets. The flow of oil was controlled by a series of electric solenoid valves that directed the flow of oil to the actuators on demand (FIGURE 5). The tractor lever controlling the remote hydraulic outlet was pulled to the rear and fastened with a rubber strap.

To perform a certain function, the operator simply selected the appropriate switch on the electrical control box (FIGURE 6). The electrical control box allowed tractors with either a close centre or open centre hydraulic systems to be used.

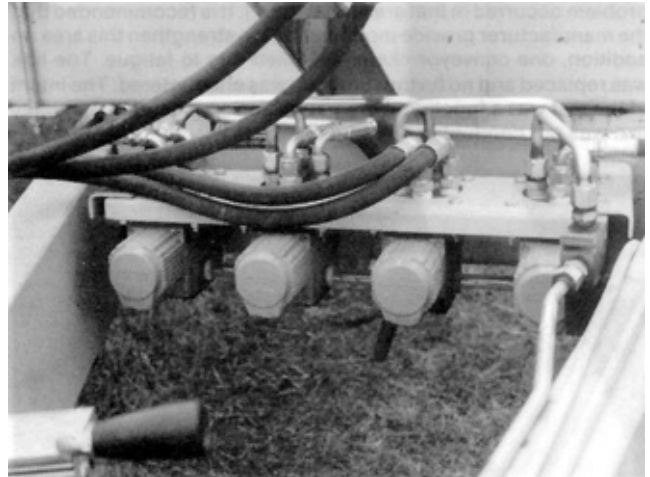


FIGURE 5. Solenoid Valves.

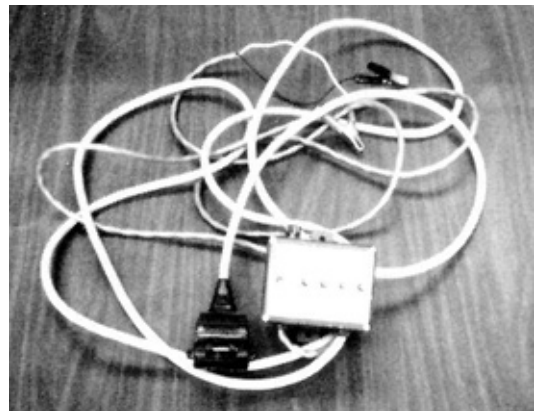


FIGURE 6. Electrical Control Box.

OPERATOR SAFETY

The Laurier H-4250 was safe to use if normal safety precautions were observed. During transport, extreme care should be exercised when operating on busy public roads as visibility to the rear was obscured. Additionally, when backing to an unloading site the operator should dismount the tractor cab and check the area for obstructions.

As the Laurier was not equipped with trailer brakes, considerable distance was required to bring its mass to a stop. As a result, it was determined that the 75 hp (56 kW) minimum tractor recommendation of the manufacturer was not of sufficient weight to safely handle the bale mover. It is recommended that the manufacturer revise the minimum horsepower requirement to 100 hp (75 kW). To stop a fully loaded H-4250 within 50 ft (15.2 m) on a paved surface, PAMI recommends not to exceed 9 mph (14.5 km/h) when towing with a 100 hp (75 kW) tractor.

The Laurier H-4250 was equipped with a slow moving vehicle sign of the proper dimensions and decals which would warn operators of the potential danger areas.

OPERATOR'S MANUAL

The operator's manual contained detailed information that included: assembly instructions, a complete parts list, schematics for electrical and hydraulics. The manual was very well organized and illustrated with adequate operation, adjustment, maintenance and safety instructions.

MECHANICAL HISTORY

The Laurier H-4250 was operated for 320 hours in varying conditions and crops. During that period, only two mechanical problems were observed. The mounting lugs that secure the right and left A-frame hitch where they attach to the main subframe weld-mounts failed. They were repositioned and welded and no further problem occurred in that area (FIGURE 7). It is recommended that the manufacturer provide modifications to strengthen this area. In addition, one conveyor chain link failed due to fatigue. The link was replaced and no further problem was encountered. The intent of the test was a functional evaluation and an extended durability test was not conducted.

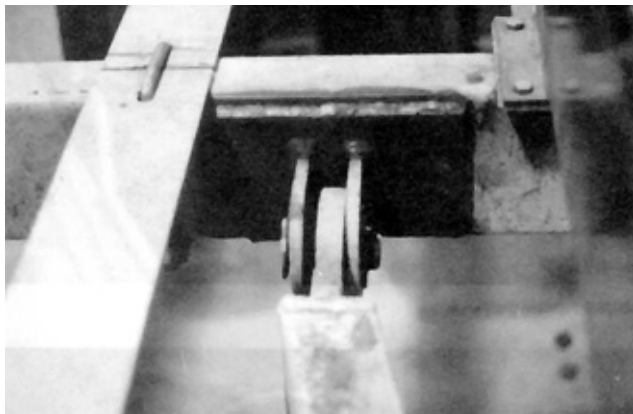


FIGURE 7. Repaired Hitch Mount Lug.

APPENDIX I

SPECIFICATIONS:

MAKE: Laurier

MODEL: H-4250

SERIAL NUMBER: H-4252

OVERALL DIMENSIONS:

-- length	39.6 ft	(12.1 m)
-- height	9.3 ft	(2.8 m)
-- road width	16.7 ft	(5.1 m)
-- field width	18.9 ft	(5.7 m)
-- bed height	3.5 ft	(1.1 m)
-- bed length	33.55 ft	(10.2 m)
-- bed rail width (centre to centre)	30 in	(760 mm)
-- ground clearance at axles	14 in	(356 mm)

TIRES: Eight, 9.5 1 x 15 x 8 ply c/w tube and 40 psi highway service

SUSPENSION: Walking beam

HYDRAULICS:

Fork Cylinder		
-- bore	3 in	(80 mm)
-- stroke	16 in	(330 mm)
-- retracted length	26 in	(584 mm)
-- extended length	42 in	(910 mm)

Bed Cylinder		
-- bore	3 in	(80 mm)
-- stroke	17 in	(432 mm)
-- retracted length	26 in	(660 mm)
-- extended length	42 in	(1.1 m)

ORBIT MOTOR

-- displacement per rev. 18 in³ (295 cc)

WEIGHT:

-- empty	6500 lbs	(2955 kg)
-- capacity	18,000 lbs	(8165 kg)

TRACTOR REQUIREMENTS

The Laurier H-4250 required a tractor of at least 100 hp (75 kW) equipped with a single remote hydraulic circuit and a 12 volt electrical power supply.

APPENDIX II

MACHINE RATINGS

The following rating scale is used in Machinery Institute Evaluation Reports:

Excellent	Fair
Very Good	Poor
Good	Unsatisfactory

SUMMARY CHART

LAURIER H-4250 ROUND BALE MOVER

RETAIL PRICE:	\$14,200.00 (October 1986 f.o.b. Portage la Prairie, Man.)
EASE OF OPERATION:	Excellent: once an operator became proficient, all that was required was to select the proper switch for the desired function.
QUALITY OF WORK:	Very Good: Very little crop loss or twine damage was experienced if bales were firm and well formed.
RATE OF WORK:	Very Good: Dependent on operator experience. The high load capacity of 18,000 lb (8165 kg) made high rates of work possible.
POWER REQUIREMENTS:	100 hp (75 kW) minimum. Smaller tractors have enough power to draw and operate, but not enough weight to effectively control bale mover in a sudden stop situation.
OPERATOR SAFETY:	Safe to use, if a tractor of sufficient size and weight were used.
OPERATOR'S MANUAL:	Very Good: well written, organized and illustrated.
MECHANICAL HISTORY:	Hitch A-frame weld mounts failed and a conveyor chain link failed.



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